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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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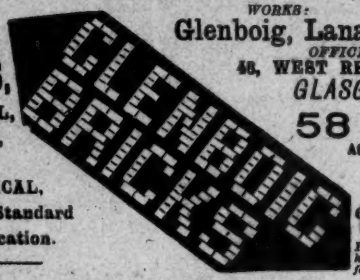

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FIG. 536.

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VOL. CLXV., No. 3174.] WEDNESDAY, MARCH 12, 1924. [76TH YEAR.

EDITORIAL NOTES.

Lessons from the Cantor Lectures.

We have come to the end of the three Cantor Lectures delivered by Mr. E. V. Evans at the Royal Society of Arts; and our anticipations have been amply fulfilled. The lectures, we have full confidence, will in the first place have the effect of placing thermal value in its rightful position in our technical operations; and, in the second place, they will broaden and distance outlook on our carbonizing practices. There has been in connection with the fundamental process of the gas industry a deficiency in scientific method, in statement in the matter of results, and (through this) in ability to interpret them. This the therm is capable of setting right. In fact, from the institution of the therm, there have been those in the technical ranks of the industry who have seen that the new designation, with its complete connotation, would have a value far beyond that of being a basis of charge—that it would be revolutionary in working by bringing about a better correlation of results, and would influence more comprehensive control over the whole course of carbonizing operations and their products. On the other hand, there were a number of even well-known engineers who failed to see that the therm possessed any such potentiality. What to them was then latent is gradually unfolding itself, and is receiving wider acceptance. It is hard to believe that anyone who has held the narrow view regarding the technical value of the therm will continue that attitude after perusing the three Cantor Lectures which have been published *in extenso* in our columns, and which, there is assurance, will be productive of much good effect. They will, as we have before presaged, have an outstanding interest in our carbonizing literature, and a large influence in connection with practices, and the survey and presentation of results.

The computation of carbonizing efficiencies by calorific value is not a new thing; but the computation has suffered by the want of comprehensiveness and exactitude. In the gas industry, it has been common procedure to estimate the value of a process by its ability to produce volumes of gas which would enable the responsible engineer to comply with the statutory value. But there has been little else done in the way of ascertaining how the gaseous product stood in relation to the thermal energy of the coal, and how that energy was distributed generally among the products of carbonization, and how much of it had been lost—not necessarily all wasted—in the process. In the first lecture, Mr. Evans showed that the introduction of the therm into our technical operations enables this condition to be completely changed—enables the supplanting of that which has been somewhat crude by scientific exactitude, which will assist in the control of operations, in the selection of types of plant most fitted to individual conditions, and in the determination of methods in any particular set of circumstances. To utilize the therm to these ends, it is necessary to know the thermal energy contained in the original coal, and then ascertain the thermal value of the gas, tar, and coke. Having obtained this information, there is knowledge at once, in respect of the coal carbonized, as to the efficiency of the working, and as to the distribution of the thermal value in the products. Mr. Evans, it will be remembered, supplied an illustration as to the value of this information by comparing the thermal values of the various products obtained by subjecting similar coal to high-temperature and low-temperature carbonization; and the comparison showed absolutely that the low-temperature system was not more efficient than the high-temperature one, and that the distribution in the products of the thermal energy contained in the original coal was not, under the low-temperature process, in accord with the obligations and purposes of the gas industry.

The lecturer proceeded to examine the causes of the loss of gaseous thermal energy in the process of carbonization. Initially, the prevention of gaseous thermal wastage and the conservation of the energy of the original coal lie in the possession of a suitably designed retort-bench and accessory plant; but this possession does not continuously help if there is not maintenance in the highest state of structural efficiency and repair. These are essentials to good working; but, even so, we have known of retort-settings built by the same contractor, and identical in every respect, including the coal used for carbonization, and the results have been very divergent—due largely not to the plant, but to the differences in the methods of working and supervision. There is no question that inefficient plant (including structural disrepair) and inefficient management have between them been responsible for a considerable amount of loss to the gas industry; and this over long years has been cumulative, and altogether beyond appraisement. The beautifully constructed records showing the efficiency of the gas-making process cannot be said to have any common application, though there is no reason why they should not have application in similar circumstances, with a general recognition by technical officials of what should be done to prevent therm wastage. The requirements which Mr. Evans laid down for a retort-setting are ideal, though, as he admits, not comprehensive of all that might be advanced in this respect. To realize the necessary conditions means supervision of an equally ideal order. All this applies not only to the retort and the heating arrangements, but to the accessories. There are admittedly refinements which may be altogether impracticable in many gas-works which have not the resources of those of the South Metropolitan Gas Company. The thermal models, for instance, to which Mr. Evans introduced us in the first lecture are interesting and informative; but we are afraid they would not be regarded as practicable in many gas-works, and may be looked upon as a refinement of a more or less academic order. The destructive effects of the admission of air to hot gases are dealt with; as well as the effect of leakage at the retort mouthpieces. In both ways, high gaseous thermal yields can be obtained; but there is always a loss of true coal gas—the extra therms being made at the expense of another therm-containing constituent of the coal. The greatest economy is to be attained by carbonizing in a tight retort. As to the admission of air round retort mouthpieces, there is a large amount of carelessness in this respect; and to it is due much of the overheating and stoppages of ascension pipes. The point was made by the lecturer. The air drawn in at the retort mouthpieces is capable of producing the combustion of gas and tar in the ascension-pipes. This alone is a waste. The high temperatures, too, thus created convert the ascension-pipes into tar distilleries, so producing pitch and stopped pipes. The first lecture helps one to realize how unsuitable plant, plant in disrepair, and faulty operation are all contributors to losses of thermal energy in the products of carbonization.

In the second lecture, the study was carried much deeper; the main part of it being devoted to showing the close relationship existing between gas and tar, which subject, in the opinion of Mr. Evans, has not received sufficient attention in the past. But before entering upon this phase of the

matter, the lecturer indicated that gas may be too pure in respect of inerts—that gas made in very tight retorts, with a combustion chamber temperature of 1300° C., and maintained under a vacuum of 3-10ths water-gauge, contains such a small percentage of inert constituents, and consequently is so low in density, that it is unsuitable for use in the inverted incandescent burner. An adjustment can be effected in various ways—in the case in point, Mr. Evans admitted (prior to purification) waste gases to a 585 B.Th.U. gas, containing 4 p.ct. of inerts, to a sufficient extent to lower the calorific value to 572 B.Th.U. containing 6 p.ct. of inerts. When this is done, the subsequent admission of air to the purifiers reduces the gas to the desired calorific power (560 B.Th.U.), and provides the necessary specific gravity. There may be some question as to the need for a refinement which produces a gas which subsequently requires treatment in this way. But advantages arising from the regulated treatment are found in the constancy of the thermal value and specific gravity that can be maintained, and the closeness with which the declared calorific value can be approached. Besides, there is the protection given to the thermal values of the other products. By this means, there is no marked degradation of the gas or tar in producing a gas of 560 B.Th.U., though there is no apparent increase in thermal yield. This is probably due to the fact that, when higher temperatures are maintained for the purpose of decomposing the gas down to the required standard, a certain degree of tar-cracking takes place—establishing the point that, as the therms of tar and gas are interchangeable, the true significance of results cannot be obtained unless the thermal value of the tar is taken into account. There is no question that there has been a large failure by investigators to appreciate the inter-relation between the three chief products of carbonization. By the lecturer the tar and gas therms are classed together as "volatile therms."

The results of an investigation which was carried out to determine the effect of the rate at which the coal charge is heated upon the relation between the yield of gas therms and tar therms supplied an interesting section of the lecture. It was a small-scale test; nevertheless there is technical interest in the disclosures. However, we can only in this connection quote the outstanding conclusion, which is that there is a tendency for the highest volatile therm yield to be obtained by practising the most rapid heating possible. While such a condition is conducive to high gaseous therm yields, slower and more careful distillation is a tar-conserving process, and exceedingly slow distillation a coke-conserving one. Although the results are not directly comparable with the large-scale working of to-day, they have supplied the basis of further investigations of the principles of obtaining enhanced yields of volatile therms. From this point it was a natural step to consider the question of how far the cracking of tar into gas can be regarded as profitable. There is, of course, a limit to the quantity of gas which may be obtained from tar, without producing an undue deterioration of the latter, as regards both its physical properties and chemical constitution. But the conclusion is arrived at that rapid carbonization is essential for obtaining high gaseous thermal yields, owing to the fact that the average temperatures obtained throughout the coal charge are higher. In consequence, the tar is subjected to a higher degree of cracking, resulting in the production of gas at the expense of the tar. This practice, it is submitted, is the most economical one for the gas industry, providing the resulting tar does not possess an appreciably lower market value, or that troubles with stopped pipes are not created.

The final lecture will have special attraction for carbonizers who make technical study of their work with the view to improving efficiency. We have seen that rapid heating is an essential to a high volatile therm yield. Now the question is as to how best to modify the carbonizing process, in order to increase the rate of heat transmission not only through the walls of the retorts, but through the charge itself. Regarding heat transmission through the walls of retort, Mr. Evans had not much to say. A material which is a better conductor of heat than fireclay is a desideratum. The use of carborundum is one means of promoting the object; and with this material experiment is being made in America. The problem of increasing the conductivity of the charge is one which presents greater interest; and the lecturer showed that it is indirectly the plastic layer which is responsible for the low rate of heat transmission. The problem is therefore to prevent the formation of the plastic layer, and so avoid the large-celled structure which is the cause of the slow conduction of heat through the mass. The prevention may be accomplished by the admixture of coke or coke breeze with the coal; and it is preferable that this should be done by briquetting the mixture without a binder, as is being done at the Fuel Research Station. The rate of heat transmission and that of gas evolution are materially greater when using a 75-25 coal-coke mixture, briquetted. The first thing that will occur to some gas engineers is that this would reduce the throughput of the retort, and therefore the gas-producing capacity; but, when it is seen that in one case the process has been accelerated to such an extent that the gas was expelled from the coal in six-and-a-half hours instead of nine-and-a-half, it will be appreciated that the conditions are entirely altered, and that time offers good compensation for the reduced weight of coal in the single charge, so that throughput in a given time is not reduced. Not only this, but, with the particular coal tested, more volatile therms were obtained—true, at the expense of the coke. However, the coke is of a higher order in respect of its reduced cellular structure, and greater density and combustibility. All these conditions—the quicker heat transmission in the charge through the breaking-up of the plastic layer, the improved coke (which will secure a more extensive market), and the larger quantity of volatile therms (in one test some 8 to 9 per ton of coal)—are the advantages from the gas maker's point of view. There is, on the other hand, an inclination on the part of the tar to contain more free carbon, and there is the problem of reducing the ash content of the coke. However, Mr. Evans is convinced that if the quality of coke can be improved, a larger market will be secured, and through it an increased revenue per therm will be obtained, which will contribute to the reduction of the selling price of gas per therm. Furthermore, the introduction of briquette carbonization would increase the range of coals suitable for gas-making purposes. It is an attractive picture of which sight will not be lost, because ardent workers are busy upon its details.

These Cantor Lectures are for the gas industry highly encouraging and promising. They show that the introduction of the therm is not only an advantage to the consumer, but it is a technical incentive to work in the quest for higher efficiencies. They have shown, too, what may be done to realize better control in, and higher results from, our carbonizing operations; and they point to practicable methods for making still further improvement not only in obtaining more volatile therms (which will cost less), but in providing a solid fuel which will open up a larger market than the gas coke of the present—good though that market is to-day. Not for the first time, has the industry something for which to thank Mr. Evans; it is further indebted to the South Metropolitan Gas Company, for the study which has enabled the delivery of these Cantor Lectures (which will stand as a classic in carbonizing literature); and to the Royal Society of Arts for having been the means of obtaining publicity for the results of the study.

Modern Methods on a Medium Sized Works.

There is an all too prevalent idea in the section of gas undertakings that may be classed as of medium size that scientific management and control is not for them—that it is too costly, and takes up too much time, and therefore, on balance, is not profitable. This is a mistake that is not only regrettable, but is a contribution to inefficiency and uneconomy which lowers the average productiveness of an industry which prospers the more the cheaper it can sell its primary commodity. The address with which Mr. G. S. Frith, of Runcorn, inaugurated his presidency of the Manchester District Institution of Gas Engineers is a complete answer to those who doubt the expediency of raising the efficiency of their managerial operations by incorporating in them the aids to realizing higher efficiencies. We are not making (because it would not be true of all medium-sized concerns) any sweeping assertion as to this want of appreciation, and dismissal of modern methods, and retention of unrefined ones of ancient prescription and application, which should have a place among the things abandoned by the industry, wherever possible. Mr. Frith's address in its main part shows the advantages he has gained by applying scientific procedure in works making approximately 150 million c.ft. per annum.

The President comes of a progressive gas family. Some forty years ago his father was one of the pioneers in

generator firing. It is not surprising therefore to find the son utilizing, within the limits of his opportunities, those things which modern knowledge proclaim to be necessary to enable high efficiencies to be secured. He has a laboratory at the Runcorn Works which has been rearranged and enlarged, and is now fully equipped with up-to-date appliances to conform to the requirements of the Gas Referees under the Gas Regulation Act. Furthermore, provision has been made for complete gas analyses, and for tests of coal, tar, spent oxide, ammonia, &c. This is all necessary; and if, as one of our modern mentors—Mr. E. V. Evans—has been telling us in his Cantor Lectures at the Royal Society of Arts, we should control the distribution in the carbonization products of the therms contained in the coal used, we must have facilities for testing not only the coal and gas, but the tar and coke, for their thermal values. With this information available, the process of carbonization can be governed so that, according to individual circumstances, the most profitable issue can be realized from it. Mr. Frith has the means for doing this; and we fancy that, as he develops his control work, he will be studying the advantages of this fascinating subject of the actual (and not assumed) thermal distribution in the products of the original thermal value of the coal. The President, too, believes that a wise expenditure of capital upon works modernization is a most profitable investment; and so is a close and complete—not a partial—supervision of the processes upon a gas-works. Without that supervision, there are leakages from the otherwise attainable maximum economy and efficiency; and the cumulative effect of these leakages, we know from investigation, often largely exceeds the cost of their prevention, and profit is lost.

In the modernization of his plant at Runcorn, the President preferred to continue adherence to horizontal retorts, using a projector type of combined stoking machine, though he thinks it likely that developments in future in the industry will be largely by continuous vertical retorts. Horizontal retorts are very far from being played out. It is the system most widely in use. The day may come when other types of carbonizing plant will show such a superiority in productive power, in any circumstances, that horizontal retorts may become extinct; but that time is not yet, and there are no signs of it. There are, in fact, many engineers who, with coals of certain physical characteristics, would not change over from horizontal to vertical working. At the same time, too, there are many works which, possessing horizontal retort equipped houses, can reconstruct the settings on modern lines, and this, as Mr. Frith has found, with highly profitable results. It is nearly a decade since Messrs. Drakes, Ltd., built the new horizontal bench at Runcorn, with all the necessary furnishings, including Cort's anti-dip pipes, tar towers, the firm's projector type of combined stoking machine, coal breaking and elevating plant, and a steam-driven electricity generating set. This was an opportune conversion, for the weight of coal per charge was increased, and per stoker was advanced from 2·1 to 5 tons, resulting in a saving of approximately £1500 per annum in carbonizing wages alone, or equivalent to 3s. 4d. per ton of coal carbonized—a highly important consideration for a Company of the size of the Runcorn, as well as for their customers. In addition the make per ton was increased; and we have no doubt that this was good coal gas, when we see later in the address the care that is taken to maintain the "pull" on the retorts, so as to avoid the "slightest risk" of producer gas being drawn through the walls of the retorts. The success in this respect is proved by the fact that the average inerts do not exceed 13 p.ct., with a declared value for the gas of 500 B.Th.U., which is the gas the President considers best suited to the requirements of the consumers in the area. It would be interesting to have from him a few more details as to how he gets down to near this figure with straight coal gas, in view of the reasonable 13 p.ct. of inerts. We have said the changes were opportunely made. They came at the beginning of the war, effecting their economies, from which during the hard times consumers and undertaking derived benefit which would not have been possible under the old order of things. They also enabled the release of men for the army. Before leaving carbonizing practices, attention may be directed to an alteration Mr. Frith has made to his producers. The changes are shown by a sectional drawing accompanying the address. It will be seen that the usual angle-bars forming the furnace bottom have been taken out, and the bearers have been reset, so that the bars now rest at an angle of about 32° —leaving a space of approximately 18 in. between the end of the bars and the back wall of the producer. Mr. Frith is highly pleased with the change; for clinkering has been reduced to a minimum, and, so far, it has not been necessary to remove any of the bars—it being an easy matter simply to push the clinker over the ends of the furnace-bars, and extract it with a shovel from the ash-pan. This is a change from the trouble experienced in the task of clinkering in some works where the type of furnace is not of a particularly modern order.

There are, of course, plant and processes that are tried in gas-works that have to be discontinued for various reasons. Some of them have been necessary to meet the exigencies of certain times. There is the question of steaming charges in horizontal retorts. This is now little practised. It was practised at Runcorn; and upwards of 70 therms per ton were realized in the gas. But we know nothing more than that from the address—nothing as to the quality of the coal, or of the thermal value of the tar or coke. Nor are figures given to show the gaseous therms produced per ton by plain carbonizing, without steaming. In the circumstances, the results cannot be properly assessed. The disadvantages of the steaming were a reduced throughput per retort, and consequently an increase in the cost of wages. Then again there is a Tully water-gas plant on the works, which was very valuable during the great coal strike, and is so now for emergency purposes. The capital outlay upon it has amply repaid the Company; but the President finds his straight coal gas costs him less than blue water gas, and so the plant is not at present in commission. Then there is the benzole plant. Runcorn adopted it for patriotic purposes, when the call came. Its introduction brought heavy liabilities in the way of naphthalene troubles and deterioration of the leather diaphragms of meters; and no doubt the President, like many other gas engineers, finds the thermal value of benzole in the gas of greater importance than the market value of the crude benzole, after meeting extraction expenses.

There is much else in the address of considerable practical interest; all being matters dealt with just as would be expected by those who know Mr. Frith well. And all the members of the Manchester Institution do know him well. He has been a member of the organization for a quarter of a century; and he has held office as Hon. Secretary. Without exception, the members agree that his due is the highest honour the Manchester Institution can bestow. Hence his tenancy this year of the Presidential Chair.

The Critical Coal Position.

CERTAIN newspapers appear to be adopting a hopeful attitude as to the issue of the negotiations between the colliery owners and the miners' representatives regarding a new wages agreement. We also hope for a peaceful but reasonable ending to the discussions; but we shall not predict directly or obliquely what will probably be the issue. There will be time enough for praise when an agreement is reached, ratified, and signed; it will be time enough for censuring one side or the other when we know the nature of the rock upon which the efforts have been wrecked, if unhappily this be the case. There are signs of uncertainty among the miners' leaders as to the likely issue. The President of the Miners' Federation (Mr. Herbert Smith) is one of the soundest of leaders, and he does not suffer from that immoderation with which some of his colleagues are afflicted. But Mr. Smith has lately taken to the common form of strategy when trade unions are seeking to get more money for their people. He has been trying to gain sympathy from the public by referring to miners' wages in comparison with the risks they run. They do run risks; the occupation is their own choice. But the risks have with time been reduced in severity; and the loss of life has been lowered per 1000 men employed, and per million tons of coal raised. It is something to be able to say this when so many more men are employed in the mines, and so much less coal is raised by them in the total and on the average per man. It is distinctly strange, in view of the melancholy picture drawn by Mr. Smith, that so many more men should have flocked to the mines to be employed in them. Apparently they like the life, the seven-hour day, and the smaller number of hundredweights of coal which are produced per man per day on the average than was the case before. The average applies to the whole industry, and not to the districts, because the production in the Yorkshire, Derbyshire, Notts, Leicester, Cannock Chase, and Warwick-

shire coal areas is up to 20·31 cwt. per man per day, as compared with the average output per man of 21 cwt. in the industry in 1913. But there is in other areas a gradual descent from that 20·31 cwt. to 11·71 cwt. in the Bristol district. The variation is due to the differences in the character and age of the mines and to the differences in the work performed by the men. They cannot help the former; they can help the degree of energy put into their work. In last September quarter, the average production for the industry was 17½ cwt. per worker per day, contrasted with the 21 cwt. in 1913. Mr. Smith's painful picture was, of course, drawn for a purpose. But it is one of the signs that even the leaders are not sure as to what is going to happen. Another is found in connection with the miners' delegates' meeting to-morrow. There is no prospect that the Negotiating Committee will be able on the occasion to report that a provisional agreement has been reached. But it has been hinted in the papers that it is quite possible the delegates will resolve to take a ballot at once as to whether there shall be a strike on the expiration of the present agreement, should no fresh agreement have been arrived at by then. We cannot say whether this will be done. It is, however, quite possible; but if it is, it will only be with one object—to exercise a bigger pressure on the owners. The question of increasing production, and so improving wages and making British coal more attractive by reducing the price, has not yet found its way into the programme of the Miners' Federation. That is an aspect of industrial economics that does not appear to concern them. If the men were compelled to choose between, on the one hand, higher pay and on the other the shorter hours and lighter work of to-day at the present rates, we believe they would select the latter. But (judging from the statements of the leaders) they want it all their own way—more pay, the retention of the shorter day, and no more work. How that sort of thing is going to advance the interests of the industry is not at all clear.

Another Big Amalgamation.

Another substantial fusion of gas-supply interests is likely to take place shortly. It is the consummation of a scheme first mooted not far short of sixty years ago; so no one can accuse the Companies concerned of having been precipitate in bringing about the union. It is the amalgamation of the Walker and Wallsend Gas Company with the Newcastle-upon-Tyne and Gateshead Gas Company. In the Act of the former in 1866, and in that of the latter in 1867, provision was made for the transfer; but, though there have been attempts during the intervening years to give effect to the proposal, there has never until now been mutual agreement. Terms, which are regarded as favourable, have been determined; and the shareholders of both undertakings have affirmed the necessary resolutions. The Chester-le-Street Company have also decided to part with their undertaking to the Newcastle Company. A Special Order is to be applied for to authorize the two transfers. When they are made, the Newcastle Company will in one move add about 2 million therms to their sales. According to the Board of Trade returns for 1922, the Newcastle Company had a sale of 16,115,434 therms; the Walker Company, 1,673,666; and Chester-le-Street, 228,755. These figures added together make 18,017,855 therms. The total would be larger if the 1923 figures were taken, seeing that last year the Newcastle Company had an increase in their sales of 6·58 p.ct.; and the Walker Company one of 4·84 p.ct. The number of consumers possessed by the Newcastle Company at the end of 1922 was 127,691; by the Walker Company, 13,768; and by the Chester-le-Street Company, 2626—making a total of 144,085. This figure would also be bigger if the 1923 figures were available.

Appliances Sold and on Hire.

The references to this subject in the last two issues of the "JOURNAL" have aroused considerable interest round about London. In first mentioning the matter, we quoted from the Directors' report of the South Suburban Gas Company a figure of 4463 as the number of gas appliances sold and let on hire during 1923. We understand that this alludes only to gas cookers and fires; but if other gas-consuming appliances are included, then the total number would be 12,381, as compared with 10,992 for the Croydon Company's district, and 12,065 for the Tottenham Company's area. The figures go to show how enormously the domestic use of gas is increasing in the suburbs of London.

More Money for Research.

The estimates for the Civil Service and Revenue Departments for 1924-25 show that on the Civil Services there is a contemplated reduction in commitments amounting to £37,177,318, and in the revenue-producing departments of £160,827. The total figure for which the Chancellor of the Exchequer will have to budget is expected to show a reduction of £30,600,000. The list of departmental economies is long, and the list of increases short. Among the latter is the estimate for scientific and industrial research (£328,281), which is £50,938 higher. The requirements for scientific investigation are £201,450—an increase of £12,729. No complaint will be made of expenditure in these directions; it is of national importance that research should be used to aid our progress.

Assistant Director of Fuel Research.

It will be generally recognized that, in appointing Mr. F. S. Sinnatt, M.B.E. (Mil.), M.Sc. (Tech.), F.I.C., M.I.Min.E., to be Assistant Director of Fuel Research, the Lord President of the Council has acted wisely. In Mr. Sinnatt, Dr. Lander (the Director) will have an assistant as enthusiastic as himself in this work. The new Assistant Director is at present lecturer in fuels in the University of Manchester, Faculty of Technology. He is also Director of Research to the Lancashire and Cheshire Coal Research Association, and has been in charge of the physical and chemical survey of coal seams which the Association are carrying out for the Fuel Research Board in the Lancashire and Cheshire coal-fields. From this, and from the references to his work that have appeared from time to time in our columns, it will be seen that Mr. Sinnatt has had a large experience in work which is undergoing good development in connection with the Fuel Research Department.

A Legal Minimum Wage.

The question of a legal minimum rate of wages is again coming to the front in Parliament. A motion introduced to the House the other evening by Mr. Compton (Labour Socialist) urged the Government to proceed without delay with the Bill introduced by the then Government in 1919, to constitute a Commission to inquire into and report upon the legal minimum time rates of wages. Most people are strongly opposed to State intervention in the matter of regulating wages, inasmuch as the capacity of different industries to pay definite rates varies, and in any one industry from time to time. Theoretically, we are all willing to accept the principle that a living wage for all workers is the correct thing; but it is not so easy to accept it if it is accompanied by the condition that it should be a "first charge" upon industry. Our labour friends should realize that fundamentally in all industry capital is needed. Without it, there could be no industry, and no employment. In view of this, capital is entitled to consideration as well as labour when the question of a "first charge" comes up. It would be a good thing if the labour-socialists would realize the truth of a remark made by Viscountess Astor, during the discussion of the motion, that the real problem is co-operation between capital and labour. Another striking observation was made by Mr. Frank Hodges, who desires peace in industry, but he knows "this can never be achieved until the human unit gets a far larger share of the proceeds of industry than it does at present." The remark has interest when one knows how trade unionists and socialists have opposed co-partnership in industry, though we cannot accuse Mr. Hodges of this, seeing that, when Secretary of the Miners' Federation, he was opposed to the scrapping of the national wages agreement (which included the sharing of any excess profits) before a thorough attempt had been made to secure its amendment. But the trouble was that the desire to amend was on a basis which did not consider whether or not the industry possessed the capacity to meet the additional liability in respect of a minimum wage and an increased share of the excess profits for the miners, without injuring the industry by raising the price of coal to the consumers. However, the motion was carried, after Mr. Shaw (Minister of Labour) made a reservation, on behalf of the Government, with respect to the words "proceed without delay." The Government have their hands pretty full without undertaking further obligations at present.

PERSONAL.

The Blackburn Town Council have approved an increase in the salary of Mr. G. P. MITCHELL, Gas Engineer and Manager, from £900 to £1000 per year.

Mr. F. S. SINNATT has resigned his lectureship in fuels in the Faculty of Technology at Manchester University, in consequence of his appointment as Assistant Director of the Fuel Research Board under the Department of Scientific and Industrial Research.

At a meeting last Wednesday of the Gas Committee of the Gourock Town Council, Mr. DAVID REID, of Huntly, was appointed Manager of the Corporation Gas-Works. There were about sixty applicants for the position. Mr. Reid was formerly on the staff of the Port-Glasgow Gas Department.

The position recently advertised in our columns for an additional Chemist at the Aldershot Gas, Water, and District Lighting Company's principal works, Ash Road, Aldershot, has been filled by the appointment of Mr. N. PARTINGTON, B.Sc., of the Oldham Corporation Gas Department. There were about a hundred applicants.

Mr. JOHN H. CHEW has been appointed, out of 34 candidates, as Blackpool's Gas Engineer—a post previously held by his father, Mr. W. Chew, and for half-a-century by his grandfather, Mr. John Chew. Mr. J. H. Chew was for ten years Deputy Manager, and since his father's sudden death nearly a year ago has been acting Manager. The appointment is worth £800 a year.

Mr. J. D. SMITH, M.Inst.C.E., Engineer and Manager of the Belfast Corporation Gas-Works, has been created a Justice of the Peace in the Ulster capital. Mr. Smith, who is a native of Hawick, went to Belfast in 1910 from Stirling, where he was Manager to the Stirling Gas Light Company. Previously he was Assistant Manager for the Hawick Gas Light Company. Mr. Smith was President of the Institution of Gas Engineers at the annual conference in Belfast last June, and in 1908-09 was President of the North British Association of Gas Managers.

OBITUARY.

Lieut.-Col. A. H. LAYBOURNE, J.P., who has died at the age of 61 years, was a Director of the Newport (Mon.) Gas Company, with which undertaking he had been associated for many years.

We regret to record the death of Mr. W. COTTRELL, Secretary and Commercial Manager to Messrs. C. & W. Walker, Ltd., of Donnington, Shropshire, which occurred suddenly on the 10th inst., at his residence, from heart failure. He had been connected with Messrs. C. & W. Walker for upwards of fifty years, and was well known to many engineers in the gas industry.

TOWN GAS FOR STEAM RAISING.

Recently an interested party assembled at the Burnley Gas-Works to witness a demonstration of steam-raising by a "Kirke" steam boiler (manufactured by Messrs. Spencer Bonecourt, Ltd.), using town gas as a heating medium in place of the usual coal or coke fire. The boiler, which is a small unit only 5 ft. in length and 15 in. in diameter, is provided with 7 gas-burners of special design, and 7 heating tubes, one to each burner. The boiler is further provided with all the usual accessories, and has, in addition, a thermostatic valve, operated by the steam pressure of the boiler, which automatically reduces the gas consumption when the required working pressure is exceeded. From the boiler, 122 lbs. of steam per hour can be obtained, and the steam generated during the demonstration was utilized in working a Tangye horizontal water pump capable of pumping 1800 gallons of water per hour.

The construction of the boiler was explained to the party, and a test was made, starting with everything cold. In about 40 minutes full steam pressure of 120 lbs. per sq. in. had been reached.

We understand that the boiler under demonstration is the smallest size of its type manufactured, and that boilers of a capacity of 1400 lbs. of steam per hour are in use. This apparatus should prove a great boon to engineers, printers, launderers, and manufacturers who require small supplies of steam either continuously or intermittently. The cost of the boiler is not great, and the gas can be obtained in Burnley at the special rate of 6½d. per therm. The advantages obtained by using the gas-heated boiler are quick steaming, cleanliness, and elimination of stand-by losses, coal-storage, ash removal, &c.

The Burnley Gas Department are also in a position to provide boilers of a similar type for the provision of hot water for factory purposes, and intend to make a demonstration with apparatus for this purpose at an early date.

The Huddersfield Engineering Society.—We have received from this Society a copy of their Journal of Proceedings for the twenty-fourth session (1922-23). This contains much valuable information; among the papers read before the Society being one by Dr. E. W. Smith. From this we hope shortly to give a few extracts.

ELECTRICITY SUPPLY MEMORANDA.

THE electrical people in some towns are concentrating on the electric cooking load; and some of them are harbouring the idea that their way of doing the culinary work in the home can beat gas out and out. But the difficulty is to get them to show exactly the work that is done by electric cookers, and the true basis of their comparisons. Shoals of figures are produced which give no positive information. It is getting a common thing to point to a certain number of electric cookers having been fixed during a period in which exceptional exertions have been made to place them; the capital cost is quoted, as well as the aggregate consumption and revenue. Such figures cover much that it would be interesting to know. It is, however, perfectly obvious from the average figures supplied as to consumption that, taking known efficiencies for the various operations, the amount of work ordinarily done on a gas-cooker could not be accomplished by the expenditure of current named. For example, it is surprising how much the hotplate of a gas-cooker is in domestic practice used for the provision of hot water. That the comment is justified is seen by a paper read by Mr. R. A. Lower, the Sales Engineer of the Norwich Corporation Electricity Department, before a recent Salesmanship Conference of the Electrical Development Association. It seems that there was an intensified campaign in Norwich last year in connection with domestic electric cookers; and there was success in placing 456. The capital cost was £7670, which averages nearly £17 apiece. It is said that in over 90 p.ct. of these cases gas-cookers were displaced. The consumption by the cookers is given as 586,500 KW.-hours; and, at 1d. per unit, the revenue as £2443. In the first place, assuming the consumption extended in all cases over the twelve months, it would average 1286 KW.-hours per cooker; but it is seen that the consumptions varied from 500 to over 3000 KW.-hours. It is obvious that neither 500 KW.-hours nor 1286 KW.-hours on an electric cooker would render the same service as is generally demanded of the gas-cooker in a household. But the 456 electric cookers having been fixed last year, it cannot be assumed that the consumption figures all dated from Jan. 1. This being so, the total consumption is of very little use, as showing what the minimum, maximum, or average consumptions will be with a full year's cooker use.

Electric Cooker Business.

Revenue, Maintenance, and Loan Charges.

There is another point. The rental revenue is given at £714. This, we may assume, does not refer to the entire year for the whole 456 cookers. If it did, it is clear that the cookers would be mostly small ones, as we see earlier in the paper that a cooker with boiling-ring, combined boiling-ring and grill, and small oven could be supplied on hire at 8s. 6d. per quarter (34s. a year), and a cooker with two boiling-rings, grill, "large" oven, and plate-rack, could be supplied at 12s. 6d. per quarter (50s. a year). Or perhaps some of the cookers came under a somewhat dangerous system, which is said to be "popular" in Norwich. This is to offer a complete cooking installation at an extra ¼d. per KW.-hour over and above the current charge, to include hire and wiring of cooker, maintenance, &c. Under this tariff a certain minimum consumption must be guaranteed by the consumer; this varying from 850 to 1200 KW.-hours, according to the size and type of the domestic cooker. A certain number of consumers, Mr. Lower says, have demanded a slot meter; and it has been found a good idea to calibrate the meters at 1¼d. per KW., and to allow a rebate of 4d. in the shilling after a certain minimum number of shillings have been inserted. According to Mr. Garton, he has found at Ipswich that the system of charging an extra ¼d. per KW.-hour for the hire of apparatus, with a guarantee to use or pay for a certain consumption, is fatal. We are not surprised; and such arrangements often lead to discontent. Anyway, the large consumer pays more farthings than the small consumer. However, returning to Norwich, Mr. Lower puts the maintenance costs at 10s. 1·7d. per cooker per annum. We wonder whether he has allowed in this for increasing depreciation with advancing years. In any case, by that much the revenue from rental has to be decreased. On 456 cookers the maintenance costs would be £231 4s. 7d. per annum. Calculating the interest on, and repayment of, loan on the basis of a life of ten years (the number of cookers mentioned cost £7670), it looks very much as though Norwich has been too modest in fixing its rental. Another point which interests is as to whether the £7670 included all installation costs. Then there are the development costs—the salaries of the salesmen engaged on this work, showroom, and other general expenses—which are not shown, but have to come from somewhere. We notice, too, in the discussion on the paper, that it was pointed out that the disparity in the cost of hiring as between gas and electric cookers should be reduced, and be hidden away by adjusting the rates for the energy. Mr. Lower admits that the rates for the hire of gas and electric cookers are not comparable; but people who "use electric-cookers know they are worth more than gas-cookers, and are prepared to pay the extra value." Strange we have not observed any large evidence of this.

How to Develop the Cooker Business.

The object of the paper, however, is not to expose for admiration what Norwich has done. It was to raise a discussion on the best methods of trying to develop a cooking load. There has of late been quite a lot of counsel given on this subject; but in it all there is nothing that is novel—in fact, in the discussion there was really very little attention paid to cooking-load developing methods. One thing Mr. Lower urged is a simple inclusive tariff. This has been projected upon notice over and over again. He thinks that with such a tariff the consumer will know from the outset what annual expenditure he is embarking upon. How can he do this without foreknowledge as to the amount of work he will be demanding from his cooker during the year? The next move is to advertise and circularize to get the electric cooking idea firmly in the minds of the public. In Norwich, a month's free trial of a cooker is advocated. The hope was also expressed that some national cooking advertising will be done by the Electrical Development Association. Then it was urged that the services of a lady demonstrator of the right personality, tactful, and of good address should be secured. A showroom kitchen should be part of the scheme. As the lady demonstrator would bring in inquiries not only for cookers but other things, male representatives must also take part in the work; and above all things these representatives should be users of "all" electrical apparatus. But Mr. Lower is hard; and we pity these representatives, seeing that this advocate of trite methods for developing the cooker business does not approve of the policy of giving special terms to these sorely tried men. We do not know why he disapproves. Perhaps it is because the special terms would make them careless in their consumption of current; and this would indeed be a bad advertisement for the 3420 B.Th.U. kw.-hour. Or peradventure the cooker business may not be able to bear special terms for the representatives, in view of its sluggish development, and the comparatively little profit there is in it on the terms which it is necessary to adopt in order to obtain some of it. Then Mr. Lower emphasized the need for bringing prominently to public notice the advantages of cleanliness, efficiency, &c., of electric cooking; and he urged that every endeavour should be made to stamp out the idea that electric cooking is a costly experiment. We have heard all this before. Among other expenses which should be incurred to make a success of electric cooking are the employment of a lady demonstrator to keep in touch with the users; the employment of suitable men for wiring and fixing; the reduction of maintenance arrangements to a fine art to give real good service; and the maintenance of the supply of current! The domestic electric cooker business is a matter that manifestly requires a considerable amount of nursing and defence in order to promote and retain it.

Getting New Business.

In Glasgow there is an Electrical Society; and at a recent meeting Mr. R. Hardie, of the Corporation Electricity Department, addressed the members on the subject of "How Best to Create a Demand for Electric Service." But again we fail to find anything novel in the way of advice to the electrical industry as to how it should bring about a development of its trading connections. A strange thing is that, though Mr. Hardie is responsible for the electrical sales department, and is competent to advise as to the methods which should be pursued to obtain new business, there is indication in the paper of considerable dissatisfaction on his part with the progress that the department is making. It is one thing to advise; it is another thing to get a Committee and a City Council to adopt advice; it is a greater and an all-important thing to persuade the public to patronize your wares. An inclination to do so has to be created. In expressing his dissatisfaction with the progress of the industry generally, he described it as a "moribund" one, and said that something was wanted to stir it into more healthy activity. He is as hard on gas lighting as the extremists of the socialist party are on capitalists. He says that electrical men should not rest content until gas lighting in towns is as extinct as the old horse-driven hansom cab. That is absolutely cruel. He goes on to say that as to electric lighting the battle was virtually won years ago. If that is so, why is it that gas lighting is not extinct already? Further on, he acknowledges that it is not extinct, because he accuses electrical men of remaining content to look on with complacency, and see the majority of streets, dwellings, and factories "miserably lit" by gas. There must be something wrong with the eyesight of Mr. Hardie. If he came to London, we think that he could be shown, in streets, in factories, and in homes, gas lighting with which, in point of economy and efficiency, he would have some difficulty to compete. We have no doubt, too, if he would apply to his friends of the Glasgow Gas Department, they also would be able to enlighten him on this particular subject by actual object-lessons. To our mind, it is rather petty and silly to traduce the actual position of a competitor by applying to it, as being general, a description that is not true, and is therefore unjust. Mr. Hardie must know that, if it is possible to demonstrate in one set of circumstances good lighting by the agency of gas, the same standard of lighting can be obtained and maintained in any circumstances, if people will only take the necessary steps to secure the similar economy and efficiency. He girds at the gas industry for the advocacy of periodical inspection and overhauling of gas-fittings in consumers' premises. But why not? Has not the same thing been advocated in connection with the electrical industry? Mr. Lower, as seen in the foregoing paragraphs, is favourable to maintenance. Goodness knows—electrical equipment requires a tremendous amount of expert inspection and overhauling, in order to enable it to continue in workable condition. People who live in glass houses should not throw stones.

Recommendations.

Then Mr. Hardie asks the question, how are the electrical people to increase rapidly in the near future the number of electricity consumers? He talks about showrooms in which appliances are actually demonstrated. There is nothing new in that. He also says that an electrical supply authority, like a gas authority, must retain a live interest in the quality of apparatus intended for use on the mains, because the value of electricity supply to the consumer can only be judged by the service given; and if the highest service is to be obtained, only efficient apparatus should be installed. Yet Mr. Hardie, in the earlier part of the lecture, was broadly smiling over the advocacy in the gas industry of the maintenance of gas-lighting fittings! We also read that nine years ago practically the only known domestic electric appliance was the iron. The electric fire was comparatively unknown; the electric cooker was in its infancy; and water heating by electricity was considered impossible. But to-day, partly as a result of demonstrations at the Corporation and other showrooms, the public are in growing numbers rapidly gaining a first-hand knowledge of the possibilities of electric service. But a singular thing is Mr. Hardie's dissatisfaction in view of the growing numbers of the public who are rapidly gaining first-hand knowledge. It would seem that the first-hand knowledge is doing something to restrain the patronage of electrical appliances. Mr. Hardie also advocates a department whose constant duty it shall be to discover new outlets for electricity in every field. There is no doubt that the electrical appetite of our friend is very great, and that his vision as to the value of Nature's gifts is very circumscribed. His mental horizon is manifestly confined to electricity. It is a good thing for the world that this is not generally the case. This super-adviser of the electricity industry, while attempting to kick the gas industry, looked round for another victim. He found one in the electrical contractor. In the electricity industry, the severest critics of the commercial methods of the supply undertakings are the very people who are so unmercifully kicked by the supply engineers and salesmen.

Street Lighting Points.

"E. M. B." has been experimenting on street lighting, and has contributed some of his impressions and findings to the "Electrical Review." He does not think the problem of even diffusion has yet been satisfactorily solved. He points out that it is the task of the engineer to reproduce a reasonable diffusion by using the smallest possible number of units; thereby incurring the smallest cost. He will also vary the intensity to suit the local needs. "E. M. B." gives some figures which appear to him to fulfil these requirements. For main street lighting, he favours the use of large units placed at a big height, and with wide spacing between lamps—*e.g.*, to light a main thoroughfare, about 70 ft. wide, 500-watt gasfilled lamps should be used, at a height of 25 ft., and spaced 60 yards apart. For a narrower street, he would use smaller units, nearer the ground, and closer together—*e.g.*, to light a street 50 ft. wide, 60-watt vacuum lamps should be used, 15 ft. from the ground, and 40 yards apart. With this spacing tram standards could be utilized as supports. A side street would require similar units to the latter, and placed at the same height. There should be a unit on one side of the road only; and it should be placed on alternate sides with a spacing of 60 yards. "E. M. B." thinks that some engineers may be surprised that gasfilled lamps are not recommended for the smaller streets. This is because of the glare, due to the smallness of the light-giving area; the result being that, if the filament is visible below the canopy of the reflector, the eye is "caught," and if the filament is covered, then only the area below the lamp will be lighted. He deals with the importance of reflectors, and favours the use of a horizontal type, which has only a small camber—one about 2 ft. in diameter for a large unit, and half that for a small one.

Supply of Electricity by Gas Undertakings.

The electrical papers have been somewhat exercised over a remark made by Mr. Reginald Clarry, M.P., on the occasion of the visit of the Midland Junior Gas Association to the works of the Sutherland Meter Company, Ltd. Mr. Clarry, who comes of a good gas family, is much like most gas men. He concedes that electricity has a considerable field of utility before it in various directions; but he also knows, from personal experience and observation, that the field for the gas industry is also one of such magnitude that it is immeasurable. He further recognizes that there are many places in the country where a gas undertaking and an electricity station could not both make a living; and, in view of this, he is hoping during this session of Parliament to bring in a small item of legislation, which, if passed, will make it easier for gas undertakings to supply electricity. This is probably the Bill to which reference was made at the last meeting of the Gas Companies' Protection Association, and which has been drafted by Mr. Cooper. It is considered by Mr. Clarry that this Bill would be of great advantage to small country districts where there is not room for two separate concerns.

A VISIT TO THE STANTON IRONWORKS.

Manchester and District Junior Gas Association Joint Visit with the Yorkshire Junior Gas Association.

A joint party numbering about 120 met at Derby, whence they proceeded to Stanton Ironworks in motor coaches. They were received by Mr. Crompton (Chairman), Mr. H. D. Taylor (Commercial Manager), and Messrs. Upton, Delfos, Cornelious, Cotton, and Miles. An interesting tour round the works was made.

THE "SPUN" PIPE.

The spun pipe is formed in an accurately-bored steel mould, the inner dimensions of which coincide with the outer dimensions of the finished pipe, including the enlarged portion at the socket. This mould is revolved on its own axis by means of an impulse water turbine inside a water-cooled iron casing. The latter, with its revolving mould, is caused to traverse backwards and forwards on its bedplate by a hydraulic cylinder installed beneath it. At one end of the mould a Peltor wheel is fixed, and at the other end are gland rings somewhat similar to the collar thrust bearings employed in marine work. Through the annular space between the cylinder and the casing the cooling water is circulated at constant temperature and pressure. A tilting ladle and cantilever trough supply the molten metal to the revolving mould.

The only core used is that necessary to shape the inside of the socket. This core is clamped into position by two cotters at the socket end of the mould. The tilting ladle is filled, and the turbine started. When the mould has acquired a proper speed, the ladle is tipped by hydraulic means, and discharges the metal into the cantilever trough. When the socket is filled with metal the casing is allowed to traverse away from the ladle at a speed which assures that the molten metal will line the inside of the mould evenly through its entire length. When the mould has reached its extreme position, the spout is fully withdrawn, and any surplus metal discharged. The metal solidifies in a few seconds, and, contracting, allows the pipe to be withdrawn. Annealing is rendered necessary by the rapid cooling of the metal in the water-cooled mould; and in order to restore homogeneity, the pipe is passed through a gas-fired furnace. The pipe is withdrawn from the mould at red heat, and immediately passed to the furnace. By rotary operation the pipe is not only completely annealed, but the concentricity is preserved. The temperature of the pipe (1250° Fahr. gradually increasing to 1800° Fahr.) is controlled by three "Cambridge" recording pryometers, which give readings at the socket, the centre, and the spigot end.

The annealing furnaces are fired by gas having a calorific value of 225 B.Th.U. Withdrawn from the annealing furnace, the pipe is cleaned and passed horizontally through the dipping tank, being rotated to ensure a uniform coating. The coating mixture is of the standard of Dr. Angus Smith's solution, and is heated by waste gas from the annealing furnace. When fully dried, the pipes are taken to the hydraulic pumps, and tested at a pressure at least 50 p.ct. greater than that specified in the Standard Specification for cast-iron pipes. The actual casting occupies only about 14 seconds, and the complete operation 75 seconds. One machine will cast up to twenty pipes an hour, making the maximum possible output of the shop equal to 1920 pipes per shift. As the "Stanton" spun-iron pipe is made to the British Standard Specification, it would socket up with any standard sand-cast pipe without difficulty. Circumferentially the variation in thickness is less than 1-500oth in. The spun pipe is approximately 25 p.ct. lighter than ordinary cast-iron pipe, but as the tensile strength of the spun metal is at least 70 p.ct. higher than that of cast iron, the spun pipe is from 30 to 40 p.ct. stronger.

THE "STANTON-HUME" CONCRETE PIPE.

This is the product of another centrifugal process. The output of this plant is about 100 tons per diem. The pipe is manufactured without reinforcement for low-pressure work, but high pressure demands the inclusion of reinforcement of carefully selected steel wire. Centrifugal action brings the reinforcement to a central position, and the concrete, spreading evenly over the inner surface of the mould, completely embeds the wiring. For the "A" class of pipe, the Company use three parts of graded granite with one part of cement and sufficient Leighton Buzzard sand to secure the filling of the voids. For class "B" the mixture is two parts of graded granite, one of cement, and one of sand. For higher pressures the proportions are two parts of sand and one part of cement.

At the conclusion of the visit to the plant, the firm entertained their visitors to luncheon in the staff pavilion.

Mr. J. H. CLEGG (Burnley) remarked upon the welcome offered to them. The last joint visit was in 1915; but this year marked the recommencement of what was to be an annual arrangement.

Mr. BUCKLEY (Manchester) expressed his pleasure in according to Mr. E. J. FOX (Managing Director), the Chairman (Mr. Crompton), Mr. Taylor (Commercial Manager) and the staff of the Stanton Company their best thanks for a most interesting visit. Gas men were all interested in cast-iron pipes. The process they had seen was a revolution in pipe making, and all the engineers who had seen it expressed their admiration.

Mr. LEA (Chesterfield) seconded this vote.

Mr. CLEGG said he was surprised to learn that the firm had 14,000 employees and a staff of 2000. What they had seen reflected great credit upon the organization of such a vast undertaking, which had its own collieries, iron-ore mines, sand pits, blast furnaces, limestone quarries, and foundries.

Mr. CROMPTON said his Board all appreciated the visit of the two Associations. He was very sorry Mr. Fox was away. Since 1917 the firm had grown by leaps and bounds. They had spent £750,000 on developing the plant and process, and he thought the spun pipe was an epoch-making invention.

Mr. TAYLOR mentioned that the firm had turned out 700 miles of spun pipes last year. They worked 24 hours a day, Sundays included.

INAUGURATION OF EXTENSION AT THE NEW GRANGE WORKS OF MESSRS. ALDER AND MACKAY, LTD.

At a time when signs of industrial development are welcome, the enterprise of Messrs. Alder and Mackay, Ltd., of Edinburgh, is notable. Owing to the growth of their business as manufacturers of gas-meters, they have found it necessary to carry out a considerable extension of their premises. The newer and extended part of the firm's work was formally inaugurated on Wednesday of last week by Lord Provost SLEIGH.

The Lord Provost was accompanied to the New Grange Works, Stewart Terrace, Edinburgh, by Treasurer Stevenson, Councillor James Stewart (Convener of the Corporation Gas Committee), Councillor Gorman (Convener of the Lighting Committee), and other members and officials of the Corporation of the City of Edinburgh. Following the formal inauguration of the extension, the guests and visitors made an interesting tour of the works. There was much to see that was alike instructive and profitable. For instance, there was a practical demonstration of meter painting by compressed air. The moulding shop was a centre of attraction. Here a variety of moulds, and the different grades of sand used in the many processes, were exhibited. The various exhibits in the showroom demonstrated the enterprise of the firm, and the pains they take in this work.

The total area of ground covered by the works in Stewart Terrace is 58,800 sq. ft., and the extension provides an additional floor space of 8800 sq. ft. A sum of approximately £10,000 has been spent in the acquisition of this much-needed addition. The whole of the buildings are well supplied with safeguards against explosion and fire. The firm employ a staff of 543 in connection with the New Grange Works.

After a comprehensive tour of inspection, the guests were motored back to the centre of the city, where luncheon was partaken of in the Caledonian Station Hotel. Mr. J. MILLER THOMSON, the Chairman of the Board of Directors of Messrs. Alder and Mackay, Ltd., presided.

Lord Provost SLEIGH, in giving the toast of "The Firm of Messrs. Alder and Mackay, Ltd.," said that he appreciated the honour of inaugurating the extension to the firm's works. He had often wondered just why it was that Edinburgh took second place to Glasgow in commercial and industrial enterprises. He was glad to think that the city was asserting itself now and was branching out with the idea of finding in course of time its rightful place. Messrs. Alder and Mackay had all along shown commendable enterprise. Nothing pleased him more, as head of the Corporation, and nothing gave more gratification to his colleagues in the Town Council, than the knowledge that new industries were being introduced, or that existing ones were being developed and extended. He had nothing but praise for the energy of Messrs. Alder and Mackay. They had performed triumphs in the science of gas-meter manufacture. He had been assured that the extension which had now been inaugurated was an absolute necessity for a growing business. He hoped that the firm would continue to make headway. Their future operations would certainly be followed with the keenest interest by himself and the members of the Town Council of Edinburgh.

Councillor JAMES STEWART (Convener of the Corporation Gas Committee) said he had been delighted in what he had been privileged to see at the New Grange Works. The triumphs there only emphasized the fact of the supremacy of gas. The streets of Edinburgh were practically all illuminated by gas; and Edinburgh, it would be acknowledged, was one of the best lighted cities in the kingdom. Gas was becoming more and more a necessary adjunct of every household. Gas-cookers were being installed throughout Edinburgh. There was a clamant demand for gas, and the Corporation Gas Committee were doing everything they could. He had long been familiar with the enterprise of the firm whose guests they were that day. Undoubtedly Messrs. Alder and Mackay had played a splendid and notable part in the gas industry. The inventions and patents of the firm had been of incalculable service to all who had the control and supervision of gas undertakings. He was ready to prophesy a great future for the prepayment meter, the efficacy of which had been so convincingly demonstrated at the works. He hoped that the business of Messrs. Alder and Mackay would continue to expand.

Councillor GORMAN (Convener of the Lighting Committee) said it gave him unbounded pleasure to be able to congratulate Messrs. Alder and Mackay on their business acumen. In the performance of his duties he dealt with gas, as well as electrical, problems. It seemed to him that if manufacturers of gas-meters and gas-appliances generally were to show enterprise similar to that demonstrated at the New Grange Works, gas as an illuminant would be in great favour, and would deservedly merit first place in the lighting of the City of Edinburgh.

Mr. J. MILLER THOMSON (Chairman of the Board of Directors of Alder and Mackay, Ltd.), in acknowledging the toast of "The Firm," said this was a red letter day in the history of the Company. He was well aware of the deep interest that the Lord Provost had always taken in the industrial development of the City. That day he had struck a new

note in these matters. The presence of so many representatives of such important Committees as the Gas Committee and the Lighting Committee was most gratifying. No one could be more interested in the work of the Gas Committee than they were. Comment had been made upon the fact that they were such large consumers of gas. There was no doubt that a consumption of nearly 8 million c.ft. was large. Like many other businesses, the firm had a comparatively small beginning. In May, 1850, the business was begun by Mr. Henry Alder, at the Abbeymount Meter Works, in Edinburgh, so that it had been established for nearly three-quarters of a century. Ten years later the business was removed to the Grange Works at the Sciennes, where it was ably carried on by the late Mr. Alexander Mackay, who had doubtless been well known to many of them, and also by the late Mr. Joseph Bennet, who had been interested in the technical side. The rapid extension of the business entailed corresponding extension of the premises; and in 1891 a removal was made to the New Grange Works, Stewart Terrace, Edinburgh. It would thus be seen that the progress of the business was wholly identified with the City of Edinburgh. As an indication of its progress, he might mention that in 1882 there were 38 men employed with the firm. In 1891 the number had increased to 63. At present the Company had 543 employees. In 1891 the wage bill was about £6700 per annum—it was now over £81,000. In 1891 the power in the works was 6½ H.P.—to-day it was 228 H.P. In 1923, 50·5 p.ct. of the meters tested in the City of Edinburgh by the Government tester came from their Company. In their workmen they had a body of skilled men who had grown up with the Company, and whose conduct and loyalty were beyond question. In Mr. Anderson, their chief expert, they had one who had earned a well deserved reputation for inventiveness in connection with their specialities. One in which the Lighting Committee would be more particularly interested was the automatic apparatus for public lighting, which had been introduced into portions of the City of Edinburgh, and elsewhere. This was an extraordinary invention, because it enabled the whole or part of the public lamps in the City to be extinguished or relit simply by pressing a button.

Treasurer STEVENSON, in toasting the health of Mr. J. Miller Thomson, said he had nothing but praise for their hosts. In Mr. Thomson the firm had assuredly found a man who was endowed with gifts which were capable of enabling him to carry on the splendid work of his predecessors—those who had been the pioneers of the firm in its early days, and had done so much to surround Messrs. Alder and Mackay with a great deal of merited prestige. Personally, he had known Mr. Thomson for a long time, and it was true to say of him that he was a notable example of a good man. It had been his good fortune to know Mr. Thomson's father. During his lifetime he had shown zeal and fidelity in the performance of his duties, and could always be counted on for conscientious service. To him (the speaker) it had been a matter for surprise that Mr. Thomson had not followed in civic service the footsteps of his father. He supposed that most of the company would be aware of the fact that Mr. Thomson senior had at one time been a Provost of a burgh. Though his son had not followed him in municipal service, he had in other directions emulated his example. For instance, he had been equally assertive and enterprising in furthering the interests of the gas industry. It was well known that Mr. Thomson, senior, had for a long time been connected with the Bo'ness Gas Committee, and he had rendered useful service to the profession of gas engineering in that seaport town. He felt assured that those of them who had gone to the New Grange Works at Gorgie that day must have come away with a high appreciation of the energy and enterprise dominating the firm. In the development and extension scheme that had now been so auspiciously launched, they wished the firm every measure of success.

Mr. MILLER THOMSON'S acknowledgment concluded the enjoyable proceedings.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Recent Technical Publications.

By H. J. HAILSTONE (Rochdale).

COAL SAMPLING.

No matter how carefully an analysis may be carried out, the results depend for their reliability upon the accuracy of the sampling; and, so far as coal is concerned, there is probably no more difficult task than that of obtaining from a mixed bulk a thoroughly representative laboratory sample. Conditions are bound to differ in various works, and the procedure adopted will depend upon the manner in which the fuel arrives (by wagon or by boat), upon the grade of fuel (lumps, nuts, or slack), and upon the method of handling (hand or machine conveyed). The "Analyst" publishes a study of this problem made by Messrs. Coste, Andrews, and Powney, wherein the subject is approached from theoretical as well as practical points of view. Figures are given which illustrate how widely different samples may be unless due precautions are taken. The sampling of coals should be placed in skilled hands, and suitable mixing and crushing plant provided, if reliable laboratory reports are desired; otherwise the information obtained can be in no way trustworthy.

SPECIFIC HEAT OF COAL.

In "Fuel" Messrs. Sinnatt and Macpherson describe a method used for determining the specific heat and the thermal conductivity of coal. A sample piece of the coal is trimmed-down and ground to a disc of standard thickness and diameter, and is held in position between the ends of two brass bars. Good contact is ensured by means of a mercury film. When heat is applied to the end of one bar it travels along and through the coal sample into the other bar, and by noting the temperatures at various points along the bars, the conductivity of the sample may be deduced. For a bituminous coal examined this was found to be about 0·0004.

TRANSMISSION OF HEAT THROUGH WALLS.

This is a subject full of interest to students of the carbonization industries, who are concerned with heat utilization and the prevention of losses. Accurate data are scanty, and care must be used in applying such information. A contribution to "Nature" by Dr. E. Griffiths makes clear some of the difficulties which stand in the way of expressing the heat transmission by one coefficient. To determine the thermal conductivity of a brickwork slab or powder is not a difficult proposition; and methods used in experiments at the National Physical Laboratory are briefly described. The flow of heat from a wall to the atmosphere, however, is dependent not only on the conductivity of the brickwork and the atmosphere, but also upon the shape, position, and size of the radiating surface. These factors affect the conditions of convection set up, and it is therefore extremely difficult to predict results from available data. Taking the case of a vertical wall of uniform temperature, the loss of heat is not the same for all parts. Experiments showed the loss to be greatest at the base, decreasing with height for a time, and then increasing to a steady figure. The reader is referred for further information to a report of the Food Investigation Board on "The Transmission of Heat by Radiation and Convection."

HUMIDITY.

The amount of moisture carried by saturated air is dependent on the temperature, and can be worked out from the readings of the wet and dry bulb thermometers in conjunction with the use of standard humidity tables. In evaluating the specific heat of moist gases, these calculations become cumbersome and lengthy; and Mr. J. G. Greenfield, in the Journal of the Society of Chemical Industry, has described a chart which may be used to simplify very considerably work of this kind. Such a chart for use in connection with any particular gas mixture may be drawn-up on the lines indicated, and may be usefully employed when studying the efficiencies of gas-coolers.

CONSISTENCY OF TARS.

In the "JOURNAL" for July 11, 1923, p. 253, reference was made to the experimental work of D. C. Broome on this subject, and this has been augmented by further investigations which are recorded in the Journal of the Society of Chemical Industry. A study was made of the effect on the consistency of tars of adding mineral fillers and bitumens, and of prolonged heating. The suggestion is made that some surface reaction (adsorption) occurs between tars and certain filling materials. The effect of this reaction, which depends upon the nature of the mineral used, is particularly noticeable in the changes in consistency of mixtures of prepared tar and crushed limestone on prolonged standing. With regard to the use of bitumen for reinforcing tars, the fact that bitumens of different nature and origin vary considerably in their powers of increasing consistency of mixtures cannot be overemphasized. The thickening of tars during prolonged heating—a phenomenon which has long been a source of discrepancies in laboratory testing—is shown by experimentally-derived data; and references to the various theories which have been brought forward from time to time to account for this change are given. The chief cause is undoubtedly due to oxidation, which may occur even at comparatively low temperatures; but possibly other reactions, such as the condensation and decomposition of phenols, play their parts. It would appear an essential precaution to preclude free access of air to works and laboratory samples, if the eradication of discrepancies is desired.

ACTIVATED CARBON.

A good account of the properties of this material is given by Messrs. Chaney, Ray, and St. John in "Industrial and Engineering Chemistry;" and several methods of determining the adsorptive power of carbons are described and criticized. The various uses of such carbons are discussed, among these being the catalytic oxidation of sulphuretted hydrogen with air, and benzole recovery. The behaviour of activated carbon and silica gel in benzole recovery is dealt with, and the effect of temperature and moisture variations is considered.

ABSOLUTE ALCOHOL.

This reagent is often required for special analytical work in the laboratory; and a new method for its preparation has been given by Prof. Knecht and S. F. Muller before the Manchester Section of the Society of Chemical Industry. Pure dry alcohol may be distilled from 90 p.ct. alcohol to which has been added sufficient glycerine to retain the water. The operation is conducted on a water bath, under which conditions the dehydrating effect of the glycerine is complete.

WATER-SOFTENING.

The use of finely-divided dry calcium hydrate and lime-soda mixtures is described in a little booklet issued by Messrs. Sofnol, Ltd., of Greenwich. Correctly proportioned mixtures may be obtained for the water requiring treatment, and particulars of the advantages of this method are given. A companion booklet deals with the testing of waters for industrial purposes, and special apparatus and methods employed in the control of water-softening plant generally.

Prof. C. Vernon Boys, F.R.S., will deliver the Trueman Wood Lecture at the Royal Society of Arts on May 21—taking for his subject "Calorimetry."

A STUDY OF THE DESTRUCTIVE DISTILLATION OF COAL.

By E. V. EVANS, O.B.E., F.I.C., Chief Chemist and Products Manager of the South Metropolitan Gas Company.

[The last of a Series of Three Cantor Lectures delivered at the Royal Society of Arts. Monday, March 10.]

LECTURE III.

In the previous lecture it was demonstrated that rapid carbonization is essential for obtaining high gaseous thermal yields. It will be remembered that this is due to the fact that with rapid carbonization the average temperatures maintained throughout the coal charge are higher than in the case of slow carbonization, and that in consequence the tar is subjected to a higher degree of cracking, with the result that gas is produced at the expense of tar. It was decided that this practice was generally the most economical one to adopt in the gas industry provided that the cracking process were not carried to such an extent that the resulting tar possessed an appreciably lower market value, or that retort-house troubles were created in the form of stopped pipes. The question therefore is how can the carbonizing process be modified in order to increase the rate of heat transmission not only through the retort walls, but also through the charge itself. The use of retorts manufactured of a material which is a better conductor of heat than the fireclay employed to-day will solve the first of these problems. Such a material is carborundum, and this direction of advance appears to be that adopted in America. However efficient may be the heat transference through the retort walls, its progress will always be impeded within the coal substance itself, and surely the more important problem which is presented to us is that of increasing the conductivity of the coal.

PHYSICAL BEHAVIOUR OF COAL UNDER HEAT.

Before passing on to a consideration of the question of treating coal prior to carbonization in order to increase the rate of heat transmission, the author described his ideas of the physical changes which may take place when ordinary coal is undergoing carbonization. In a well-filled horizontal retort, with some 3 in. or 4 in. space above the top of the charge, it is probable that the periphery of the charge, which is in direct contact with the walls of the retort, very rapidly attains a high temperature. The rate of heat transmission to the centre of the charge would, if the material were not undergoing constant physical change, be very rapid during the first few hours, but would gradually decrease as the temperature of the charge approximated that of the retort wall. The physical condition of coal does, however, change during the period of carbonization, and particularly during the first few hours; and it is these changes which largely determine the rate at which heat is transmitted to the centre of the mass. It is known that certain resinous constituents of the coal (the gamma compounds) melt readily, and it is probable that these constituents, upon fusion, tend to cement the whole charge into one mass; but, though there may be a period in which the whole charge of the retort is in a sticky or slightly plastic condition, it is impossible to imagine that there is any degree of homogeneity in the plasticity of the mass. It is conceived that the outer crust of the charge is very rapidly carbonized and cemented into coke, and that this may take place even while, in the centre of the charge, there still exist pieces of coal which, though perhaps having become slightly plastic on the surface, still retain their identity. As the temperature of the mass gradually increases there is produced a plastic layer which forms a liquid wall through which the products of distillation from itself and from the interior of the mass have to pass. This plastic layer is probably constituted of the fusible constituents of coal, and upon decomposition froths and bubbles producing expansion of the coal charge and giving to the remaining coke its cellular structure. Now it is the cellular nature of the carbonized mass which is the cause of the low heat conductivity of the material, and it is thus indirectly the plastic layer which impedes the rate at which heat is transmitted into the charge. It is imagined that the gases evolved during the whole of this process fight their way to the wall of the retort either through the plastic layer or through the cellular coke already produced, and, if evolved at the side or bottom of the retort, travel between the charge and the retort wall until they reach the space above the charge. An untold hubbub must take place as the plastic layer finds its way towards the centre of the charge, and is there gradually heated to the decomposition point. Whereas the gauntlet to be run by the volatile matter during the early stages of carbonization was drastic, now every bubble of gas produced must fight its way through tar and other semi-liquid products, until it finds a means of exit through the innumerable channels of the partly and fully cokified mass. Each step it takes brings it into a hotter zone, and the gas molecule which we imagine started from the centre of the charge with a wonderful degree of complexity is so squeezed and pushed and heated and washed that by the time it finds its way through the coke it has been reduced to an appreciably simpler form. Even then it has to run the gauntlet of the space above the top of the charge. In all these reactions of decomposition a certain time contact is necessary, and the final form taken by this molecule will depend largely upon whether it may be pushed or pulled out of the retort before sufficient time contact has been given to break it down completely. A knowledge of chemistry does not help very much in the interpretation of this picture—in fact it rather tends to complicate matters, as it allows one to appreciate better not only the complexity of the reactions but also the almost limitless range of reactions that may take place.

INCREASING THE CONDUCTIVITY OF COAL.

This picture of the physical changes which coal undergoes on heating has indicated that indirectly it is the plastic layer which prevents heat being rapidly conducted through the coal charge; and later it is proposed to submit evidence which will demonstrate that this is actually the case. The problem therefore of increasing the heat transmission of the coal substance itself will be solved by adopting suitable means for preventing the formation of the plastic layer. The absence of the plastic layer and the avoidance of large cells will allow rapid penetration of heat through the charge, and in consequence one would naturally expect, from the conclusions arrived at in the previous lecture, that an increased yield not only of gaseous therms, but also of total volatile therms, will be realized. Now the plastic layer may be avoided or at least very materially reduced by admixing with the coal to be carbonized an inert absorbent material such as coke or coke breeze. This material, if intimately mixed, will avoid the formation of a plastic layer by providing an infinite number of small pores and channels through which gases may escape, and by absorbing the tar-like matter formed. Moreover, the tendency of the material to expand during carbonization will be reduced, as the large cells which originate from the plastic layer will no longer be formed. These large cells constitute a great impediment to heat transmission, and with the particles of coal and inert material lying in close proximity during the whole carbonizing period, a small celled structure will be produced, with the result that the rate of heat transmission will be considerably augmented.

It can be demonstrated by experiment that, by admixing coke with coal and briquetting the mixture without a binder, the rate of gas evolution is materially increased. For this purpose equal weights of the same coal, one of which is briquetted with 25 p.ct. of coke, are heated in silica bulbs in a furnace, the temperature of which is of the order of 900° to 1000° C. The rate of gas evolution is found to be materially greater in the case of the briquetted mixture, and it would therefore appear that the effect of the inert absorbent material in the coal mass is to increase the rate of heat transmission. Such an experiment demonstrates that there is a visible difference in the rate of carbonization when a briquetted coal-coke mixture is heated on an exceedingly small scale, and some results obtained when working with quantities of the order of a retort charge will now be presented. In fig. 1 are seen

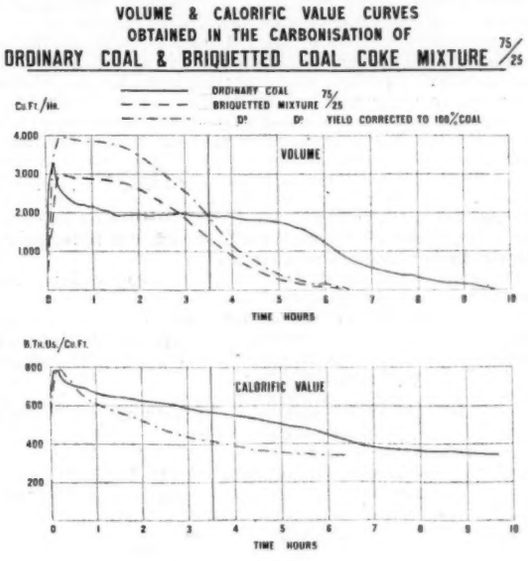


Fig. 1.

the volume and calorific value curves obtained from the carbonization of a 75/25 briquetted coal-coke mixture compared with those obtained from the carbonization of coal under similar conditions. It is the curve relating to the briquetted mixture corrected to 100 p.ct. coal that is so important, as it shows the rate of distilling the coal itself.

These curves indicate very clearly that the nature of the carbonization process is entirely changed when a briquetted coal-coke mixture is used instead of ordinary coal. The carbonizing process has been accelerated to such an extent that the whole of the gas has been expelled from the briquettes in 6½ hours, as compared with 9½ hours in the case of untreated coal. Now, as the difference between these two periods is 31½ p.ct., it follows that the throughput of coal in the form of 75/25 briquettes

would be greater than were ordinary coal carbonized. Striking though the diagrammatic curve may be, it is here that the thermal models employed in the first lecture show so admirably the difference in the rate of carbonization produced by the admixture of an inert material with the coal. Fig. 2 shows the thermal models obtained from the carbonization of ordinary coal and a briquetted coal-coke mixture. The principle of these models was described in lecture I.

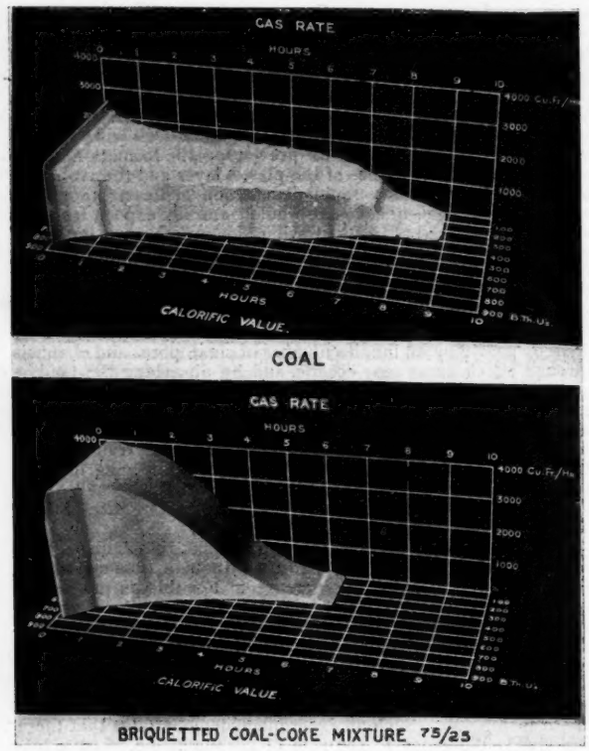


Fig. 2.

In the first lecture it was demonstrated how striking is the difference between the amount of useful work effected in the retort during the middle ten minutes of the first hour, as compared with that effected during the middle ten minutes of the last hour of the carbonizing period. Striking though this is, the difference is now greatly augmented in the case of the carbonization of briquetted coal-coke mixtures. Fig. 3 shows three sections taken from the thermal model obtained from the 10-hour carbonization of ordinary coal, and two sections taken from the thermal model relating to the carbonization of an equal weight of a 75/25 coal-coke mixture. The most outstanding observation to be made is that when briquetted material has lost practically all its volatile matter a large amount of work is still being effected in the case of the slower carbonization process of ordinary coal.

It would appear, therefore, that the admixture of an inert material with coal increases the rate of gas evolution. The next question that arises is whether this enhanced rate of gas evolution is accompanied by the superior thermal yield of gas which is to be expected from the results of the laboratory investigation prescribed in lecture II. (see Table A):

TABLE A.—*Carbonization of Coal at Varying Rates* (100 *Grammes Typical Durham Coal, Briquetted*).

Time taken to reach 1000° C.		Distribution of Heat Units in Products. Therms per Ton of Original Coal.						Process Yield of Therms.	
		Coke.	Tar.	Gas.*	Carbon and Pitch.	Total Volatile Therms.	Total Non-Volatile Therms.	Per Ton of Coal.	P.Ct.
Hours.	Mins.								
—	18	195	21·6	78·1	3·4	99·7	198·4	298 1	92·0
—	40	197	21·6	76·3	4·9	97 9	201·9	299 8	92·6
1	40	200	29·1	67·3	2 3	96·4	202·3	298 7	92·3
1	40	200·5	28·3	67·2	3·5	95·5	204·0	299·5	92·5
3	15	203	24·5	70·2	1·3	94·8	204·3	299·1	92 4
13	0	206	19·8	70·0	4·4	89 8	210 4	300·2	92·7
13	0	207	18·1	70·3	3·9	88·4	210·9	299·3	92·4

All gas measurements are made at 60° Fahr. and 30 in.

* A correction of + 1·5 therms per ton for residual gas in apparatus has been applied.

Carbonizing trials with briquetted coal-coke mixtures have been carried out in an experimental plant, but up to the present we have failed to operate the setting in such a way as to obtain through the retort walls the required quantity of heat to effect the degree of tar cracking necessary to give the enhanced thermal yield of gas. What has been done, however, is to obtain the very beneficial volatile therm yields indicated by the laboratory experiments. Some typical results obtained are given in Table B:

TABLE B.—*Carbonizing Results from Durham Coal and Briquetted Mixtures of Same Coal and Coke* (75/25).

—	Ordinary Coal.	Briquetted Mixture.	
		A.	B.
Yield of gaseous therms per ton of coal	74·7	68·2	71·1
Yield of tar therms per ton of coal	16·1	31·0	27·5
Total yield of volatile therms per ton of coal	90·8	99·2	98 6

In the two results relating to briquetted mixtures, those under A (resulting from 22 tons of briquettes) were obtained with the maintenance of a combustion chamber temperature some 50° C. lower than those under B (resulting from 12 tons of briquettes). With the increased combustion chamber temperature we have obtained a higher gaseous thermal yield at the expense of tar, but even under these conditions we have only operated the process as a tar-conserving one. It has, however, been fully proven that, notwithstanding the 25 p.ct. of inert material introduced into the retort, the throughput of true coal has been greater, as well as the total make of gas therms.

RESULTS OF ADMIXTURE OF INERT MATERIAL.

It is probably unnecessary to point out that the carbonization of this briquetted material raises manifold technical problems which are being dealt with as rapidly as time will permit. The presentation of these results, however, will be sufficient to demonstrate at least that an entirely new field is open for obtaining a more economic distribution of the therms of the original coal. As many as 8 to 9 additional volatile therms, which, as you know, are several times more valuable than non-volatile therms, have been obtained from the particular coal under test. These additional volatile therms are, as indicated in lecture II., obtained at the expense of coke, and it will subsequently be necessary to account theoretically for them. It will be appreciated that to redistribute the thermal energy of coal in this newer way will constitute an important contribution to the coal conservation problem. The tar obtained in these experiments is inclined to contain

10-MINUTE SECTIONS TAKEN FROM THERMAL MODELS.

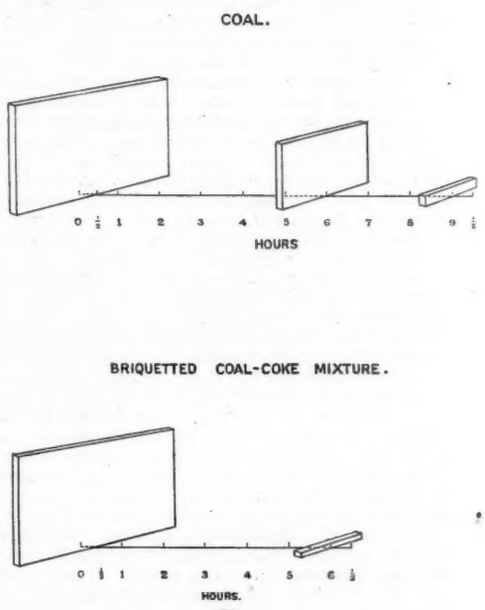


Fig. 3.

a higher free-carbon content than that produced under similar conditions from ordinary coal. The nature of the coke produced, however, is an outstanding feature of this process. It possesses very distinct advantages over the solid fuel produced from the rapid carbonization of ordinary coal.

(*Here an experimental carbonization of coal and a coal-coke mixture was carried out in silica test tubes, and it was demonstrated that the friable product obtained from ordinary coal under the conditions of the experiment was replaced by a stabilized and dense material in the case of the briquetted mixture.*)

The question of carbonizing briquetted mixtures has here been studied from the point of view of obtaining the maximum yield

of volatile therms, but other investigators have recommended the addition of inert matter to the coal in order to obtain a resulting solid fuel of high density and with a high degree of combustibility. That this solid fuel is indeed superior to coke has been admirably shown by E. C. Evans. It possesses a greater heat conductivity than ordinary coke, owing to the fact that the absence of the plastic layer has prevented expansion of the coal, with the result that a small-celled structure is produced. In consequence, combustion proceeds with greater velocity, while the powdered ash, instead of containing as much as 10 to 20 p.ct. of combustible matter (as is often the case with coke) is practically free from carbon. Many investigators are engaged in a study of this fuel, and for several years now the author has worked upon this question, and recently in collaboration with E. R. Sutcliffe and E. C. Evans. It is to their publications, and to those of Roberts and others, that reference should be made for more detailed information regarding the virtues of this fuel.

Now it has been demonstrated that the process of carbonization of a briquetted coal-coke mixture possesses distinct advantages in that it results not only in an enhanced yield of volatile therms, but also in a very superior solid fuel. Before, however, discussing the advantages and disadvantages of such a process from the gas manufacturer's point of view, it is proposed to deal with the following question—namely, what is the origin of the additional volatile therms produced in briquette carbonization?

Hypothesis to Explain Origin of Additional Volatile Therms.

It will be remembered that originally it was decided to admix an inert material with coal in order to break up the plastic layer which prevented heat being readily transmitted through the mass. In the first place it is essential to admix the correct proportion of coke as will be seen from fig. 4, which shows sections

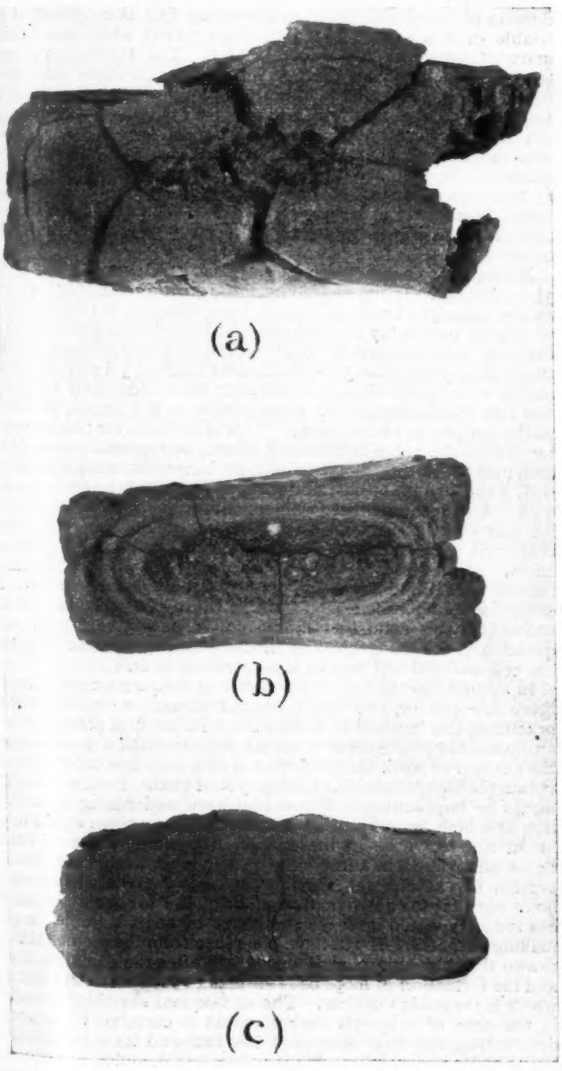


Fig. 4.

of briquetted fuel from (a) 100 p.ct. coal, (b) 85/15 coal-coke mixture, (c) 75/25 coal-coke mixture. It will be observed that while the formation of the plastic layer is reduced in the case of 85/15 coal-coke mixture, it will only be avoided when as much as 25 p.ct. of coke is admixed with the coal. That there is practically no plastic layer formed when the right proportion of coke is used in the briquette may be proved by the fact that if one arrests the distillation process at any time after the third hour the volatile matter remaining is evenly distributed throughout the briquette. The importance of this observation in supporting the contention that the plastic layer is avoided in briquette carbonization is apparent, and it contributes very materially in making clear the new carbonizing picture.

Fig. 5 shows sections of ordinary coke, and that obtained from the carbonization of a 75/25 coal-coke mixture. From these

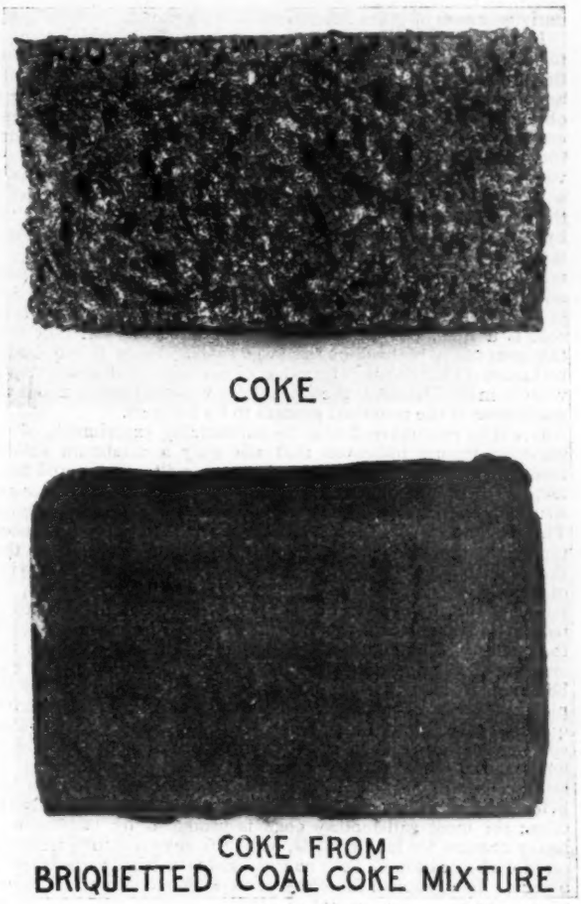


Fig. 5.

sections may be seen on the one hand the particular cellular structure so typical of ordinary coke, and which is the result of the ravages of the plastic layer, and on the other hand the very dense small-celled coke which is produced when the formation of the plastic layer is avoided. Now the larger cells of the normal coke require a considerable amount of binding material, and a coking coal is one in which sufficient binding material remains after the period of expansion (*i.e.*, when the plastic layer is bubbling and foaming) to allow the coke cells to be adequately cemented together during the shrinking process. With the production of a small-celled coke, such a large quantity of binding material is not required, and it is conceivable that a large proportion of the parent substance from which the binding material originates is distilled away and converted into volatile therms. The author believes that it is this binding material which is the origin of the additional therms produced in the rapid carbonization of coal and in briquette carbonization. Now, in order to develop this hypothesis, a further experiment, in which equal weights of coal (one being briquetted with 25 p.ct. of coke) are heated in silica bulbs, was carried out. The only difference between this experiment and the previous one is that on this occasion the silica bulbs are heated directly by means of Mèker burners so that there is developed a very large heat potential in relation to the weight of coal taken. In the previous experiment special means were adopted to ensure that, though the necessary temperature of carbonization was attained, the total available heat was limited, and more in accord with large-scale practice. It will now be observed that the rate of gas evolution is practically the same in both cases, owing to the fact that the quantity of heat available is so great that the coal charge is heated just as rapidly as the briquetted mixture. Under such conditions of drastic heating it can be imagined that practically the whole of the binding material is converted into volatile matter.

Now this observation is of great interest to the gas chemist. It is often said—and with good reason—that laboratory carbonization of coal is of little value in forecasting the results eventually to be obtained on the large scale. That the laboratory distillation fails is due partly to the fact that the furnace is out of all proportion to the weight of coal charge used, and the amount of coke binding material evolved as volatile matter is higher than would be realized on the large scale. Further, the size of the retort in relation to the coal charge is also usually out of keeping with large-scale conditions, and a degree of tar cracking is practised which causes the results to be materially different from large-scale experience. The difficulty of designing laboratory apparatus to yield results comparable with large-scale practice is generally realized, but the author does not know whether the underlying cause of these differences is appreciated.

If this hypothesis be correct—that the material which cements together the cell structure of coke may under certain conditions be distilled away as volatile matter—the question arises as to what is the maximum yield of volatile therms that may be obtained in the carbonization of coal. This the author cannot answer, but one is faced with the fact that a small-scale laboratory experiment (see Table A) has yielded nearly 100 therms of volatile matter from a coal which under normal conditions of working has given only 90, and this yield should be aimed at on the large scale. It may be pointed out in passing that if this hypothesis be true then the usual test for volatile matter in coal is of very limited utility for computing the value of a coal for gas-making purposes. The test is carried out by heating very rapidly an exceedingly small quantity of coal; and under these conditions of drastic heating the whole of the volatile matter is evolved, the coke is useless, and the result is one appreciably different from that eventually realized on the large scale. What is required to be known in computing the value of a coal is the proportion of volatile matter which is recoverable as volatile therms under the conditions of the practical process to be adopted.

It will be remembered that the carbonizing experiments of the previous lecture indicated that not only a maximum volatile thermal yield was obtainable under the conditions of rapid heating, but also that moderately slow carbonization was a *tar-conserving process*, and very slow carbonization a *coke-conserving one*. The conclusion was then arrived at that in the slowest process tar distillation took place, as well as gas evolution, and that the pitch left by the distillation of tar contributed to the yield of coke. It is now seen that, to a greater or less extent, the tendency to augment the coke yield takes place in all carbonization processes, and that the slower the process the greater the quantity of binding material left in the coke. Perhaps this analysis of the question presents a new conception of the carbonizing process. It would appear that the thickness of the plastic layer is dependent upon the rate of heating, and that a quickly-heated coal will produce an unsatisfactory coke, unless some special means such as briquetting be adopted, as the binding material required for the purpose of cementing together the large cells will have been distilled away or cracked into gas before the shrinking process commences. This is actually the case; the most satisfactory coke is produced by heating very heavy charges for long periods, while the coke resulting from the rapid carbonization of light charges yields a high percentage of breeze. The problem therefore resolves itself into either determining the minimum amount of binding material which must be left in the coke to allow it to remain a satisfactory material, or, preferably, discovering some means of treating the coal substance prior to carbonization so that upon cokification it will yield a product which is mechanically stable, but which requires a minimum amount of binding material. The latter problem has already been solved, for it has been demonstrated that the carbonization of briquetted coal-coke mixtures results not only in an increased yield of volatile therms, but also in a solid fuel which is far superior to ordinary coke. The author does not wish to overlook the point that carbonization may take place under conditions which prevent a large degree of expansion of the coke, and it is possible that the prevention of expansion by compression may result in an enhanced degree of tar cracking. Such a process does not, however, result in the recovery of additional volatile therms, because the formation of the plastic layer is not avoided.

BRIQUETTE CARBONIZATION.

It is now proposed to examine briquette carbonization from the point of view of the gas manufacturer, and to discuss the advantages and disadvantages of such a carbonizing system. There is no necessity to deal with the financial advantages accruing from the production of an additional 8 to 9 volatile therms per ton of coal carbonized, but at this stage it is proposed to consider what is perhaps equally important to the gas industry—namely, the production of a superior solid fuel. The author is certain that, if greater attention be paid to the manufacture of solid fuel, whereby its application may be greatly extended, a much wider market will be established, a greater throughput of coal will be possible, and the selling price of gas consequently reduced. Gas-works coke commands an excellent market, and is so suitable a material in many industrial operations that it cannot be replaced, but its scope would be largely extended if we could render it suitable for those industries which to-day, for certain reasons, prefer to consume raw coal. By reducing the size of the cellular structure of coke, by increasing its density and its combustibility, and by reducing the percentage of incombustible matter left in the ash, a solid fuel will be produced which will be of greater value to the industrialist than coal, because in such a material the therm will be generated with greater efficiency and with a smaller expenditure on labour. Moreover, it is to be foreseen that, if briquetting becomes expedient, then the blending of coal prior to carbonization will become possible. If this be done, an additional attribute of considerable value will be given to the solid fuel, for the production of a fuel of constant quality will effect an appreciable reduction in labour and control costs. The difficulties experienced in the working of gas-works plant owing to the varying quality of the coal employed are well known. One of the distinct advantages of coal gas is its constancy of quality, and the author now wishes to advocate that the gas industry should in the future undertake the responsibility of producing a solid fuel which is also of constant quality.

The whole organization for dealing with the products of the distillation of coal—*i.e.*, gas, tar, ammonia, and coke—exists in the gas industry, and it is to the gas industry that the nation should look for the manufacture of a solid fuel which shall completely displace the use of raw coal both in industrial and domestic appliances. It is required that our solid fuel business should extend in such a manner and with such an increased revenue per therm that it will reduce the selling price of the gas therm, and so cause gas to be even more generally applicable than it is to-day. There is a strong public movement to achieve the smokeless city, and our responsibility in the future must also extend to the supply of solid household fuel for the open fire. If we fail to undertake this responsibility, others will step in and succeed, and we may regret in the future having missed an excellent opportunity of expanding our business. The author is not advocating low-temperature carbonization, for he does not think that in the distillation of coal at low temperatures lies the solution of the household fuel problem. The low-temperature process labours under all the disabilities incurred by the production of a plastic layer during the carbonizing process. Not only is the distillation process a slow one, but, in consequence of the production of the plastic layer, the resulting fuel is large-celled and friable (unless special precautions be taken), while the binding material remaining in the coke is high. The distillation process is carried on until the coal charge has been brought into equilibrium conditions at approximately 600° C., and as a result some 6 to 10 p.ct. of volatile matter remains equally distributed throughout the mass. Were the process arrested before equilibrium was attained, an uncarbonized core would result, and the fuel would cease to be smokeless. It has already been indicated that in the case of coal-coke briquettes, the absence of the plastic layer allows heat to be transmitted so rapidly through the mass that after the first three hours the volatile matter is equally distributed throughout the coke.

Reference to the volume curve in fig. 1 will show a line at the 3½ hour stage. If the charge be withdrawn at this stage, 76 p.ct. of the gaseous therms will have been evolved, leaving 5·6 p.ct. of volatile matter (17 therms) well distributed throughout the solid fuel. It is thus possible to arrest the high-temperature distillation of briquettes after 3½ hours heating and find 5·6 p.ct. of volatile matter equally distributed throughout each individual briquette, and this applies practically to briquettes in the centre, as well as at the periphery, of the retort. This is an important observation, for low-temperature carbonizing effects, as regards the resulting fuel, may thus be obtained under high-temperature conditions, and with a throughput of coal and yield of gas and tar which are very high. The resulting fuel will constitute an excellent substitute for raw coal in the household fire. It will, in fact, be greatly preferred, owing to its ease of combustion and its high radiation effect. It possesses, however, one great disability, which must receive careful attention, and that relates to its ash content. In order to obtain excellent results in the household fire, the ash content of this solid fuel should not surpass 5 to 6 p.ct. The question of the advisability of effecting the separation of ash from the original coal will receive consideration later.

In addition to the two main claims of briquette carbonization, there are one or two incidental advantages which arise from practising this method of distillation. In the first place, it is now a practicable proposition to arrest the distillation process when the amount of work being effected is of a very low order, so as to obtain the highest possible throughput of coal. Such a procedure would be impracticable if raw coal were undergoing carbonization at a high temperature, for to arrest the process would result in an unburnt core in the charge, which would create retort-house annoyance, in addition to producing a friable coke from a portion of the charge. Further, it may also be of interest to point out that the introduction of briquette carbonization in the gas industry would increase the range of coals suitable for gas-making purposes. It will have been seen from the picture already drawn that a coking coal is one which after the evolution of gas and the formation of large cells shrinks to such an extent that the whole mass holds together. The subsequent shrinking operation in the case of briquette carbonization is certainly important in determining the final density of the fuel and its combustibility, but it is not nearly so important as heretofore, and in consequence a much larger range of possible gas-making coals is open to the gas industry.

The revolution which the introduction of briquetted material may produce in the carbonization process in horizontal retorts may, however, be small compared with the probable effect upon vertical-retort practice. Carbonization in vertical retorts possesses

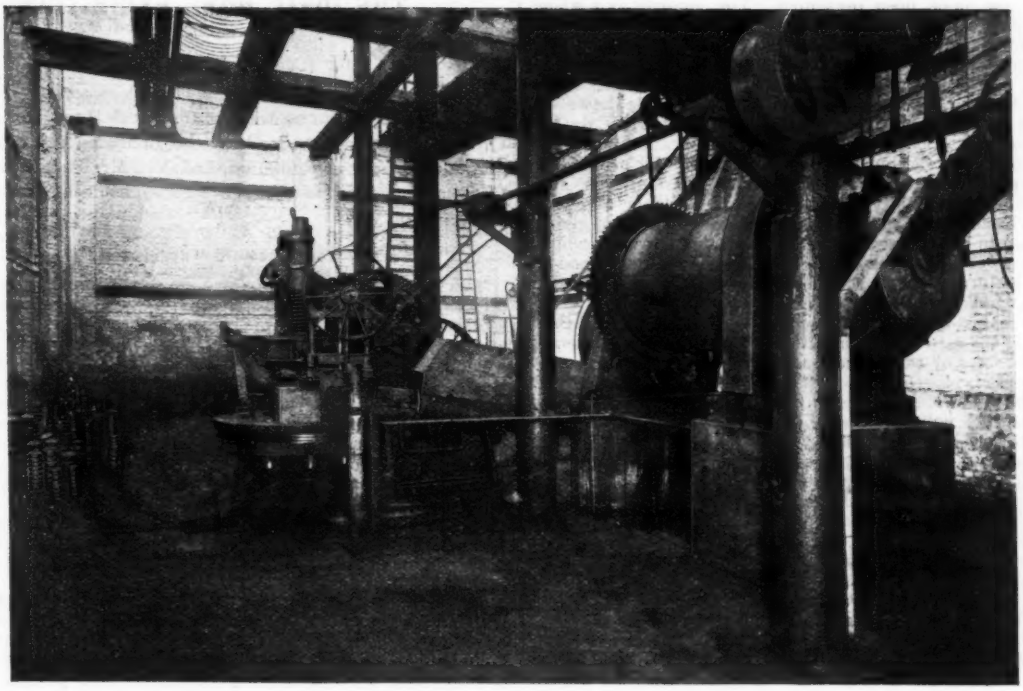


FIG. 6.

some distinct advantages over that in horizontal retorts, but it is essentially a tar-conserving process, and were it not the usual practice to steam the coal charge, the gaseous thermal yield would be relatively low. The increase in the rate of carbonization which will result from the use of briquettes is likely to cause a higher gaseous thermal yield to be obtained in the vertical retort, and steaming may then only be practised for the production of a scouring gas, and to utilize the sensible heat of the coke charge. But the advantages will not stop here, for the admixture of a suitable proportion of coke will reduce expansion during carbonization and will prevent hanging-up of the charge within the retort. Moreover, the choice of coals to be used in these installations becomes then almost unlimited. Whatever benefits the prevention of expansion and the formation of the plastic layer in coal may bestow upon those employing horizontal retorts, the introduction of briquettes may constitute the one link necessary to give the vertical retort complete supremacy in carbonizing methods.

Engineering Problems and Costs.

The main advantages to be derived from the introduction of briquette carbonization have now been briefly dealt with, and it may be of interest at this point to show the installation for grinding and briquetting which has enabled us to carry out this work (see fig. 6). The engineering difficulties of briquetting are by no means simple, but E. R Sutcliffe, who has supplied us with the necessary plant, has made a study of this problem for many years. On the right of the picture is seen a grinding mill, from which the powdered coal is transported, by means of a screw conveyor, to the charging hopper of the pressing machine. A briquette weighing some 2 lbs. is made at each stroke of the press, and is discharged from the die on to the revolving table. The briquettes are seen lying on the left-hand side of the picture.

With regard to the cost of grinding and briquetting, this is estimated by E. R. Sutcliffe and E. C. Evans to be of the order of 3s. 6d. per ton; this figure includes labour, wear and tear, depreciation, and interest. The question may be raised as to whether briquetting coal prior to carbonization is an economically sound proposition, and whether the advantages to be derived from this process—namely, enhanced yield of volatile therms, increased throughput, and a superior solid fuel—warrant this additional cost. This remains to be determined, and several years of experience may be necessary before some of the suggested innovations in carbonization are realized—if they ever are It has, however, been necessary to deal in detail with the effect of briquetting, in order to present certain aspects of this study of the carbonization process.

The operation of grinding coal prior to briquetting carries with it several advantages and a few disadvantages. The outstanding disadvantage lies in the fact that coal in a state of fine division is liable to become oxidized and its gas-making qualities materially reduced, and thus all plant utilized in grinding and briquetting should be so arranged that only inert gases are brought into contact with the finely divided coal. The author is not, in fact, sure that this will entirely prevent some reactions proceeding which may slightly affect the value of the coal as a gas-making material. Another disadvantage lies in the fire precautions which will have to be taken for dealing with finely powdered coal, but this latter question does not present any difficulty.

De-Ashing of Coal.

The main advantages of possessing coal in a state of fine division relate to the fact that not only may chemical treatment be applied to it prior to carbonization, but the operation of de-ashing is facilitated. The former opens up the wide question of the possibility of hydrogenating the coal substance prior to carbonization, for the purpose of enhancing the yield of volatile products—a question upon which investigators are working at the present time. The latter, that of de-ashing, is one engaging considerable attention in the gas industry to-day. It has already been stated that such a process becomes necessary if we are to aim at the manufacture of a solid household fuel, but the author is not prepared to discuss whether the de-ashing of coal should take place at the colliery or at the gas-works. This question, among others, is determined by geographical position, ease of transit, &c. It is certain that, if the process be carried out at the pithead, the transit of inert material, as well as other labour costs, may be avoided. It will naturally be a question of economics whether or not de-ashing should be practised at the colliery, but it is to be imagined that a large gas undertaking with a favourable solid fuel market and a cheap means of transport is likely to find the de-ashing of coal at the works to be the more remunerative process.

The separation of ash from coal is a problem beset with difficulties, the most formidable of which is that of cost. The processes devised for this purpose fall into three categories:

(1) Those dependent upon the difference between the density of coal and ash-bearing coal. The Drescher Table.

(2) Those based upon the difference in the coefficient of friction of the coal and ash-bearing coal. The Spiral Separator.

(3) Those effecting separation of the ash by taking advantage of the characteristic surface tension of certain liquids. The Minerals Separation, Ltd., Process, and the Trent Process.

Most of the known processes have now been studied either directly or indirectly. Each possesses its special attributes, and the choice between them largely depends upon the actual requirements of the coal user. Some of these processes effect a very efficient separation of ash and yield tailings containing as much as 70 p.ct. of ash. Such a degree of separation is inclined to be costly, and the author is of the opinion that, if de-ashing is to be practised at the gas-works, a less perfect process will be preferable. Such a process will be one in which the heads will contain a minimum percentage of ash, while the ash content of the tails will not be too high to prevent their being used in the gas producers required in the gas-making process. In this way the gas-works would burn its own high ash bearing coal or coke and at the same time be enabled to manufacture a solid fuel which is capable of becoming a keen competitor to raw coal. This will enable us to attain the end to which we are striving—namely, the distillation of all raw coal, prior to use, at the gas undertaking of each township.

At this stage it is proposed to summarize the main conclusions which have been arrived at during these lectures and to review some of the earlier statements in the light of the informa-

tion which has since been presented. The lectures as a whole have dealt with one aspect of the new interpretation of the carbonizing process which has arisen from the introduction of the therm system—namely, that the process is in reality one in which the therms of the original coal are distributed into the three forms, gas, tar, and coke. No attempt has been made, however, to deal with the important question of heat expenditure during the carbonization process. In lecture I., consideration was given to the production of gaseous therms and to means for preventing their wastage in the retort-house, while an attempt was also made to indicate the futility of computing the efficiency of a process on the basis of its gaseous thermal yield alone without giving consideration to the two subsidiary products, tar and coke, which are sources of potential therms. This theme was developed in the second lecture when the results of an investigation were submitted which indicated very clearly the inter-relationship existing between coke, tar, and gas. These results revealed the fact that by modifying the rate of carbonization it was possible to convert at will the process of carbonization into a coke, tar, or gas conserving process. Moreover, these results indicated that with very rapid heating, when the process was essentially a gas-conserving one, the yield of volatile therms exceeded that normally obtained by 8 to 9 therms. It will be agreed that this observation is one of considerable importance to the gas manufacturer, and in lecture III. means were considered for reproducing such results on a large scale. It was shown that by admixing inert material such as coke with the original coal a rapid rate of heat transmission was attained which resulted in enhanced yields of volatile therms. Such an innovation in the carbonizing process opens up new vistas of possibilities in the development of the gas industry, and consideration was given to some of the radical changes which would be effected both in horizontal and vertical retort practice if briquette carbonization ever became an accomplished fact. The subject is, however, in its infancy, but it is probably along these lines that future progress in the gas industry may be effected.

It will therefore be seen that the first lecture presented certain facts which may be applied in practice to-day. The second also presented facts but referred to those culled in the laboratory, while the third dealt with a few results, but also with a hypothesis which should be treated entirely as such.

All the work has received the inspiration and guidance of my chief, Dr. Carpenter, who more justly should have delivered these Cantor Lectures.

Finally it may be imagined that the large amount of work collected together could only have been carried out with the help of able assistants. It would be difficult to name all who have contributed in their work to the preparation of these lectures. May I therefore be allowed to tender my thanks to three senior assistants, Mr. H. Hollings, M.Sc., Mr. H. Stanier, B.A., and Miss E. Langdon, B.Sc.

In the course of the lecture the effect of the addition of inert material to the charge was well demonstrated experimentally; and what may be termed "experiments in parenthesis" illustrated the remarkable modifying action of inert material on the carbonization of sugar and the burning of mercuric thiocyanate (the ash of which results in the so-called "Pharaoh's serpents").

At the close, Prof. H. E. ARMSTRONG expressed appreciation of the brilliant way in which Mr. Evans had delivered the series of Cantor Lectures, which he said marked an epoch in the gas industry. At last science was being brought to bear on the carbonization of coal; and they had been not merely listening to the results of a research, but had witnessed a re-birth. In thanking Mr. Evans, he regarded also the enlightened directorship of Dr. Carpenter, whose remarkable foresight had done much to raise the gas industry on to a higher plane.

Binders for the "N.G.C." and the "F.G.E." Monthly Reports.

We have received from the National Gas Council and Federation of Gas Employers samples of the new loose covers for binding the monthly reports. This is an excellent idea; and the members will find them very useful. The reports of each organization will in future be punched, so as to enable them to be easily inserted in the binders.

Use of Silica Bricks in Coke-Ovens.—Mr. J. W. Porteous stated, at a meeting of the Northern Section of the Coke-Oven Managers' Association, that silica bricks had been used in coke-ovens for over forty years. The late Mr. Dixon, General Manager of Messrs. Pease & Partners' coke-ovens, was employing them in the arches of his bottom-flued patent bee-hive ovens in 1878. On the top of the arches was a thin layer of sand or loam, and on top of the loam were quarries 15 in. by 15 in. by 2 in. The burning gases from the surface of the charge passed through the back eye of the oven, then through a downcast to the arches, through which they circulated and returned to the upcasts to the main flue, and thence to the chimney. The heat from the burning gases passed through the silica arches to the coal, the bottom layer of which was carbonized by the radiated heat and formed into coke having a construction similar to that of the present-day bye-product coke.

THE IDEAL HOME EXHIBITION.

(*Concluded from p. 547.*)

IN the first notice of the displays of interest to "JOURNAL" readers which are to be seen at the Ideal Home Exhibition in Olympia, reference was made to the London Joint Gas Exhibit and to the stands of Radiation, Ltd., and Mr. Thomas Potterton. Occasion may now be taken to mention some of the other gas-apparatus on view.

The Brentford "Regulus II."

The Brentford Gas Company have now completed, and are—on the stand of Messrs. Hovis, Ltd., the well-known flour manufacturers—showing for the first time the No. 2 "Regulus" cooker.

This is a cooker intended to meet the requirements of the medium-sized household. It has been fitted, as in the case of all the "Regulus" series, with the Brentford Gas Company's patented air control and large flues. The advantages of this system have already been placed before our readers; but it might perhaps be as well to mention that it is found in practice that control of the air supply to the oven, in conjunction with a large flue area, does away with any trouble with the oven burners. Further, it is said that a much higher temperature can be reached, or, conversely, the gas consumption reduced, and also that the heating up of the oven is done in about one-third of the time taken in an ordinary cooker.

The hotplate is fitted with raising and lowering apparatus, so that the distance from the burner of the vessel being heated can be adjusted. This is a useful feature, having regard to differences in pressure, quality, &c. The stove is of attractive appearance, and is designed to keep the maintenance cost as low as possible.

A considerable number of exhibitors are using gas-cookers for preparing foods, &c.; and practically the whole of these firms are employing the Brentford "Regulus" cookers.

Flavel's "Leamington" Cookers.

There is displayed by Messrs. G. Matthews, Ltd., of No. 89, New Cavendish Street, W., a series of Flavel's "Leamington" gas-cookers, some of them in operation. These are made with three sizes of ovens, each of which may be fitted with two sizes of hotplates. These hotplates are of special design, and are provided with either single or double type Flavel burners.

One principle of the construction of this burner is to make an efficient mixture of gas and air by circulating these elements in a peculiar spiral motion, which produces perfect combustion on ignition. The system of perforated jets has been discarded, and the gas-flame issues in a complete circle of solid flame. The opening from which the flame issues is machined to precise limits, so that there are no variations in the size of the discharge apertures in the burners, and the size of the flame is always the same when the gas is turned full on. Low pressure from the main is the only cause that will reduce the normal size of the flame, except, of course, the usual control by the tap, when intentionally operated. Another feature of the burner is the air-trap. By depressing the finger plate of the air-trap before lighting the burner, the air is cut off and the burner lights silently. When this operation is repeated before turning off the gas, the flame goes out without noise. The air-traps are fitted with screws which can be set to regulate the air supply to the burners, and such adjustment is not affected by the use of the finger-plate. The Flavel double burner gives a flame of great heating value for quick boiling. Its advantage is that, while it is a very powerful burner when used at its full capacity, it can be employed, as a single burner, either as a small circle or as a large one, for the two taps which control the double burner can be operated independently for the outer or the inner circle. The simmering burner, by the action of a lever, can be raised or lowered to the position necessary to give any desired heat. A special oven flue closes automatically when the oven gas-tap is turned off.

Hotplates with Flavel burners are made in a wide range of sizes for attaching to existing cookers, or for use without an oven beneath. The "Utility" hotplate was designed with the object of utilizing the waste heat from an ordinary gas-ring. When it is desired to boil a vessel quickly, the centre plate is lifted out, and the pot or kettle is placed directly over the gas-flame. On the boiling-point being reached, the vessel may be removed to the side of the hotplate, and kept hot while another pot is boiled.

"Eye Level" and "Queen" Cookers.

With the cookers of the New Stimex Gas-Stove Company, Ltd., Stimex House, Balham Hill, S.W., there are no burners in the oven, the bottom of which is entirely closed. There is a gas combination range designed to take the place of the ordinary coal kitchener—being gas-cooker, fire, and circulator combined. There is provided with this range a copper circulator, suitable for use in any district, and which can easily be cleaned by the consumer. The range may be connected up to the existing hot-water installation, and is suitable for use in conjunction with a 30 gallon tank. Cookers of all sizes are shown; and the different patterns include the "Eye Level" series, the special feature of which is indicated by the name. The "Queen" cooker embodies

all the main Stimex features, but is produced at a price to suit all. Visitors are shown daily what this cooker can do.

Gas in a Bungalow.

Special mention should be made of the fact that a red brick bungalow, which is receiving considerable attention, has Messrs. R. & A. Main's gas-fires fitted in the bedrooms, and a Main cooker in the kitchen.

The "Maisie" Gas-Cooker.

The "Maisie" is claimed to be a new departure in gas-cookers, being fitted with a detachable radiator. A circular burner is arranged to take six ordinary gas-fuel pillars; the fuel being placed in a position which enables the cook to see through a mica window just what is going on—thus rendering it possible to regulate the consumption without losing any heat. The oven is fitted with a glass door, and is entirely separated from the compartment containing the burner. The cooker is shown by Mr. Henry Jones, of Grosvenor Park Road, Walthamstow, who also exhibits the "Discon" light, which is an incandescent light in miniature.

"Anti-Waste" Cookers.

There are being exhibited by the Patent Fuel Marketing Company, Ltd., of Nos. 16 and 17, Pall Mall, S.W., a series of "Anti-Waste" gas-cookers and hotplates. Nickel plated, and finished in white enamel, they are neat in appearance; and it is claimed that they have been designed "with particular regard to the essential requirements of the modern household—viz., economy, convenience, and cleanliness."

The "One-Burner" Type.

There are several examples of the "one-burner" type of cooker—for which startling claims to economy are advanced. In one case, "an outlay of 59s. 6d." is to "permanently save 9d. in the 1s. on your gas bills." Another will approximately halve the "gas you now use every week with an ordinary gas-cooker."

Water Heaters.

Since 1834 the firm of Ewart have been engaged in the manufacture of water heaters, and therefore Messrs. Ewart and Son, Ltd., of Euston Road, N.W., can claim to speak with authority on the subject. Geysers of all kinds, many of them connected-up, are shown, but a special feature is made of the "B" pattern "Califont"—an instantaneous heater of stout construction, which is made in a number of different sizes. It is claimed that, "for heating water for baths, and where small quantities of hot water are intermittently required, the actual cost of gas burned by the 'Califont' is considerably less than the cost of the coal-fire required to produce the same results, while the saving of time and the absence of dirt and dust by the use of gas as compared with coal cannot be over-estimated." A "Califont" may be fixed in the basement of a house, with hot-water service in the different rooms. For lavatory and like purposes, the "Brilliant" geyser will do all that can be desired in the way of supplying small quantities of hot water quickly.

The collection of Barralet's geysers shown by New Geysers, Ltd., of No. 200, City Road, E.C., is the result of forty years' specialization; and the latest developments are the "Two-Way" and "Reliafont," which are not intended to be fitted in the bathroom, but in the scullery, from which spot they will supply hot water to sink or bath as required. The "Reliafont" will, indeed, supply hot water to any number of taps at any distance; and no attention is required, as the action is entirely automatic. These patterns are substantially made, as is the case with the other apparatus of the firm. For small requirements, there is the "Mite" lavatory geyser.

Messrs. James Stott & Co., of No. 158, Queen Victoria Street, E.C., supply gas-heated still-room sets, and also coffee or milk urns. The firm have also a self-regulating gas-heated steam ham cooker. This permits of the "open" or "sealed" method of cooking; and no attention is required after placing the hams in the cooker. The apparatus is claimed to work exceedingly economically by automatically controlling the gas consumption. After attaining cooking heat, the average variation of temperature is under 1° Fahr.

The patent instantaneous water heaters of Messrs. C. Boyle & Co., Nos. 10 and 11, Great Newport Street, Leicester Square, are provided with 2 ft. of rubber tubing and a union for fitting to bath or sink taps. There are no taps on the apparatus. The gas-ring can be connected, if necessary, to an ordinary bathroom lighting point, by means of a special gas-tap supplied with the ring.

For the "Blighty" improved automatic washing machine ("Blighty," Ltd., Old Castle Wharf, Hampton Wick, Kingston-on-Thames), efficient operation and economical running expenses are claimed. This is the calculation the makers submit: "In a No. 2 10 gallon 'Blighty' you can wash over fifty assorted articles of household linen at the following cost: Washing material, 3d.; gas, at 3s. 9d. per 1000 c.ft., 3½d.—total, 6½d."

Portable Gas-Heaters.

The Lawson Manufacturing Company, Ltd., show their gas-heater, and the "Smoothtop" gas-range, which is made in three sizes. There are also various other portable gas-fires and radiators submitted by different firms. In regard to one of these appliances (which, it is said, will heat a room and cook a dinner at the same time) the statement is made that "for office work it is indispensable"—though we seem able to call to mind offices which are without it! Again, "it can be stood on the dining-room table without danger or injury to the table;" and "the burner is the finest gas-burner in the world." In another instance, the inquirer learns that "every detail of the radiator has been minutely and carefully studied to avoid extravagant production, and to assist the user in the national duty and domestic desire of economy in gas consumption, at the same time preserving the highest standard of sound and efficient utility."

Leeds Fireclay Company.

Some of the many uses to which their products can be put may be gathered by an inspection of the stand of the Leeds Fireclay Company, Ltd., of No. 167, Strand, W.C.

"Skylux" Economizer.

Provided with a by-pass burner, the "Skylux" non-waste boiler automatically cuts off the supply when the utensil is removed from the ring, and lights up immediately on the utensil being replaced. The makers are Messrs. Skylux, Ltd., 22, Great Saint Andrew Street, Shaftesbury Avenue, W.C.

THE CHEMISTRY AND PHYSICS OF CLAYS, &c.

In the preface to this recent publication,* the author observes truly enough that the clay-working and allied industries reached a remarkable state of perfection in craftsmanship with the aid of very little scientific knowledge. Modern requirements cannot be met in that way, and for some years past it has become increasingly necessary to study the inherent properties of the available materials and products employed, as well as the practical means at disposal for modifying in the desired direction some of those properties for special purposes.

The gathering together in a single volume of such a vast accumulation of data provided by an army of investigators operating in many parts of the world has been no light task, and Mr. Searle may be heartily congratulated on having courageously tackled it, and, as the result of his labours, having produced the portly book before us, the text of which extends to well over 600 large pages. Much of the information is supplied in the form of tables, and in many cases (probably most) full references are given to the original sources of the tabulated and other data provided—a feature of great value to students, who form one of the three main classes of persons for whom the work is primarily intended; the other two being manufacturers and users. For reasons not at all obvious, only partial references—often amounting to nothing beyond the names of the authorities quoted—are given in numerous instances scattered throughout the book. This might have been of less importance if one could rely absolutely on freedom from errors; but, in the absence of such assurance, occasions may often arise when one would wish to verify particular points.

The several properties are dealt with systematically in chapters wherein related properties are conveniently considered together. Fifty-two illustrations are interspered with the text, including representations of certain testing apparatus, with various curves and other diagrams. The subjects treated comprise not only the materials used in the manufacture of pottery, porcelain, bricks and tiles, firebricks and other refractory bricks, glass, and Portland cement, but also the refractory materials and products which find extensive use in steel and other furnaces, and in gas-works, &c.; the general scheme being comprehensive enough to cover all ordinary requirements.

On p. 438, the importance of clear statements is commendably insisted upon, with appropriate illustrations. In view of this, it is the more disappointing to find the author repeatedly failing to act on his own emphatic recommendation. Thus, to take a few examples, on p. 334 the definition of a molecular weight is not sufficiently precise. The statement as to typical radicles in the foot-note on p. 317 would not obtain general acceptance; chemists would hardly agree that the two-chain formulæ (of K. Haushofer, and of Mellor and Holdcroft respectively) reproduced on p. 348, are "very similar," as stated; the coefficient of expansion or contraction should surely not be referred to as "the *unit* of measurement," on p. 521; nor can it be regarded as satisfactory to state (p. 622) that "the amount of refraction is termed the refractive index." Some proper names appear with unorthodox spelling, in several instances consistently so both in text and index, and there are sundry other misprints which are in many cases equally harmless—at any rate, to those with knowledge acquired elsewhere. It is particularly gratifying to note that such a bulky volume is supplied with a detailed index—occupying some 60 pages in itself—which, so far as the reviewer could judge from a few random tests, seems quite adequate.

A list of errata noticed has been forwarded to the publishers.

* "The Chemistry and Physics of Clays and Other Ceramic Materials," by Alfred B. Searle. Published by Messrs. Ernest Benn, Limited, London. Price, 55s. net.

Labour-Saving Kitchens. — The up-to-date labour-saving kitchen is that which is fully equipped with gas; and much information with regard to such installations is to be found in issue No. 120 of the British Commercial Gas Association's "A Thousand-and-One Uses for Gas." By the aid of many illustrations cooking and refuse destruction by gas, and water heating by gas and coke, are dealt with.

PRESSURE ON ROLLER AXLES OF SPIRALLY GUIDED GASHOLDERS.

By R. J. MILBOURNE, Assoc.M.Inst.C.E., F.C.S.

The article on the maximum pressure on roller axles of spirally-guided gasholders, which appeared in the "JOURNAL" for Oct. 3, 1923, p. 41, deals with the subject from a purely theoretical and mathematical point of view; and consequently the formula deduced cannot be entirely relied upon in determining the actual strains and stresses in the roller axles.

The writer of the article evidently assumes that the floating bell is a perfectly elastic stiff structure, and that the guide rails and rollers are so designed and constructed as to allow the holder to tilt to such an angle that the vertical pressures on the rollers are directly proportional to the perpendicular distance of the rollers from the diameter A A_1. This condition is not obtained in actual practice. When it is realized that a gasholder bell is in itself comparatively light and flexible, and is distorted by a strong wind, it is obvious that it cannot behave as a rigid structure.

In a well designed roller carriage for a spiral gasholder, provision is made for the movement of the axle in a radial direction, to compensate for any expansion or contraction of the gasholder bell. Owing to the flexibility of the floating bell and the distortion caused by a heavy wind, the guide rails alter their position in a radial direction to an extent limited by the allowable movement of the axles, and in a circumferential direction by an amount limited by the clearance originally allowed between the horizontal centres of the rollers. The guide rollers are, however, all fixed rigidly at equal distances apart on the circumference of the tank. Hence, the various rollers cannot accommodate their positions to take up the progressive loads assigned to them.

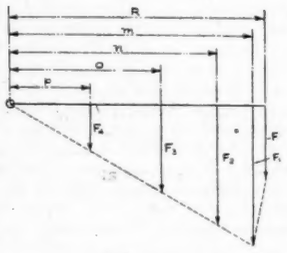


Fig. 1.

In the article referred to, the theoretical treatment is not only inadequate, but an error appears to have been made in representing the reaction "F" in the diagram as corresponding to four reactions at "a," instead of two, and has proportioned the remaining reactions on this value. Therefore the diagram to be correct should have been drawn as fig. 1.

The sum of the moments of the reactions about the central axis perpendicular to the direction of the wind, is given as

$$\frac{FR^2}{R} + \frac{Fm^2}{R} + \frac{Fn^2}{R} + \frac{Fo^2}{R} + \frac{Fp^2}{R},$$

whereas this should be written

$$\frac{FR^2}{R} + \frac{2Fm^2}{R} + \frac{2Fn^2}{R} + \frac{2Fo^2}{R} + \frac{2Fp^2}{R},$$

of which $\frac{F}{R}$ is a common factor.

Substituting, for the terms m^2, n^2, o^2, and p^2, their trigonometrical values in relation to R, the following equation is obtained:

$$\frac{F}{R}\left(R^2 + 2R^2\cos^2 18^\circ + 2R^2\cos^2 36^\circ + 2R^2\cos^2 54^\circ + 2R^2\cos^2 72^\circ\right).$$

R^2 being a common factor, this can be reduced to

$$FR\left\{1 + 2\left(\text{the sum of the squares of the cosines}\right)\right\}$$

This expression and corresponding expressions for holders with any number of guide rails can be reduced to the simple form $FR\frac{N}{4}$, where N = the number of spiral guide rails . . (1)

Assuming the tilting moment due to wind and snow to be

$$D\left(8H^2 + \frac{D^2}{3}\right), \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

as the moment of the reaction of the rollers equals the tilting moment,

$$\frac{FRN}{4} = D\left(8H^2 + \frac{D^2}{3}\right), \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

where $F = 2a$, and a equals the maximum vertical reaction of one roller.

Substituting $2a$ for F, and equating for a in (3), then

$$a = \frac{4D\left(8H^2 + \frac{D^2}{3}\right)}{2RN} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Substituting D for 2R in the denominator

$$a = \frac{96H^2 + 4D^2}{3N} \text{ lbs.} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

$$\text{or } a = \frac{24H^2 + D^2}{1680N} \text{ tons} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

= vertical reaction in tons,

$$\text{or } a = \frac{H^2\left(24 + \frac{D^2}{H^2}\right)}{1680N} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7)$$

Then, if $\frac{D}{H} = k$, the final formula should read

$$\frac{H^2(24 + k^2)}{1680N} = a = \text{maximum vertical reaction on axle in tons} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

instead of $\frac{H^2(24 + k^2)}{840(N + 4)} = a$.

It must be borne in mind that, as the guide rails on a spiral holder are inclined at an angle of 45° to the vertical, the normal reaction for the roller would be

$$a_{45^\circ} = \left\{\frac{H^2(24 + k^2)}{1680N}\right\}\sqrt{2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (9)$$

which equals

$$a_{45^\circ} = \frac{H^2(24 + k^2)}{1188N} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

The way in which the various forces are transmitted to the roller carriages is not amenable to any simple mathematical treatment, depending as it does on many factors—such as the relative stiffness of the curb and the holder bell, and the allowance for expansion due to changes in temperature.

Theoretically, under the action of the wind the holder is first impelled forward in a horizontal direction until the spiral rails on the central axis perpendicular to the direction of the wind bear upon the rollers.

The horizontal clearance of the rollers between the spiral guide rails of the holder may be found as follows:

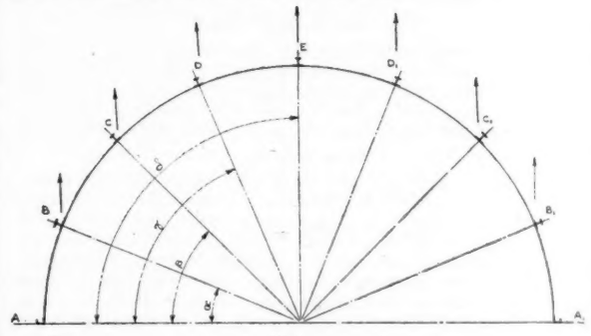


Fig. 2.

At A and A_1, the holder will move forward to the extent of the horizontal clearance allowed, which is assumed to be $\frac{3}{16}$ in., after which the rails will be in contact with the roller treads.

At B B_1, the rails will have moved $\frac{3}{16}$ in. forward in the direction of the arrows, shown in fig. 2; but the distance dx from the roller to the guide rail must be found by resolving, and will therefore be

$$dx_b = \frac{3}{16} - \frac{3}{16}\cos a \text{ in inches} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Substituting values as in the above example, then, for the spiral rails B, C, D, and E—

$$dx_b = \frac{3 - 3\cos 22{\cdot}5^\circ}{16} = {\cdot}014 \text{ in. clearance.}$$

$$dx = \frac{3 - 3\cos 45^\circ}{16} = {\cdot}055 \text{ " "}$$

$$dx = \frac{3 - 3\cos 67{\cdot}5^\circ}{16} = {\cdot}116 \text{ " "}$$

$$dx = \frac{3 - 3\cos 90^\circ}{16} = {\cdot}188 \text{ " "}$$

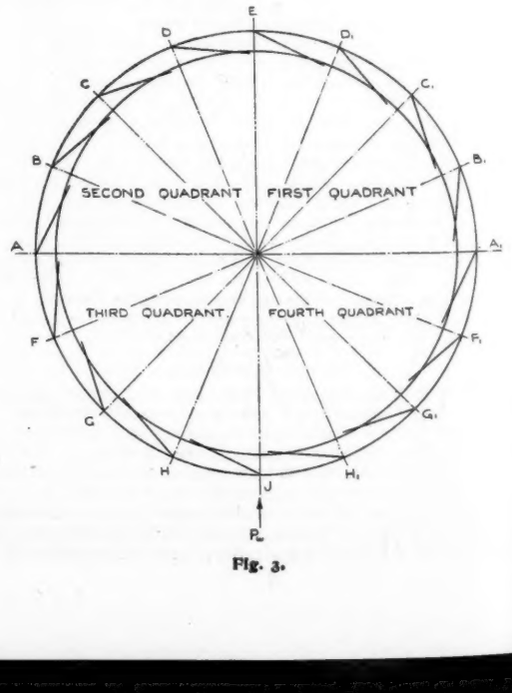


Fig. 3.

Fig. 3 is a plan showing the inclination of the guide rails at the carriages; and, for the purpose of clearness, the crown of the holder is shown less in diameter than the bottom curb. It can readily be seen that, assuming the wind pressure Pw acts in the direction indicated, the guide rails in the first and second quadrants will tend to bear downwards, while those in the third and fourth quadrants will tend to bear upwards. If the holder is assumed to be perfectly rigid, it would move bodily forward under the impulse of the wind for a distance of $\frac{3}{16}$ in. until the guide rails come into contact with the rollers at A A_1.

Assume the gasholder to tilt forward in a leeward direction, due to the wind pressure, about an axis through the rollers A A_1.

As the angle of inclination of the spiral rails is set at 45°, the vertical clearance between the guide rails and rollers (in the second quadrant) B, C, D, and E will equal the horizontal clearance at these points.

Let dy_b, dy_c, dy_d, and dy_e equal the vertical clearance between the rollers and guides at B, C, D, and E.

Then $dy_b = dx_b = \cdot014$ in.
$dy_c = dx_c = \cdot055$ „
$dy_d = dx_d = \cdot116$ „
$dy_e = dx_e = \cdot188$ „

These results are shown graphically in fig. 4.

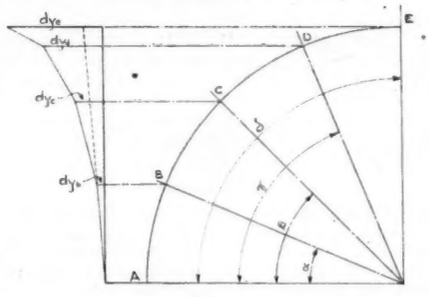


Fig. 4.

In order that the guide rails may bear down on the rollers at B, C, D, and E, the clearance at these points should be directly proportional to their distance from the axis, as shown by the dotted line in figs. 4 and 5; but the clearances as calculated and shown in the diagram are in excess, and it therefore follows that the guide rail at B will be the first to exert a downward pressure on the roller, and pressure on the rollers C, D, and E can only take place by the distortion of the bottom curb.

Continuing the investigation into the clearance between the rails and rollers in the first quadrant, as the total clearance between the spiral guide rail and the rollers is $\frac{3}{8}$ in., the horizontal clearance between the bearing rollers and the guide rails at the point—

$D_1 = \frac{3}{8}$ in. $- dx_d = dx_{d1}$.
$C_1 = \frac{3}{8}$ in. $- dx_c = dx_{c1}$.
$B_1 = \frac{3}{8}$ in. $- dx_b = dx_{b1}$.
$\therefore dy_c = dx_c = \cdot188$ in. clearance.
$dy_{d1} = dx_{d1} = \cdot259$ „ „
$dy_{c1} = dx_{c1} = \cdot32$ „ „
$dy_{b1} = dx_{b1} = \cdot36$ „ „

These results are shown graphically in fig. 5.

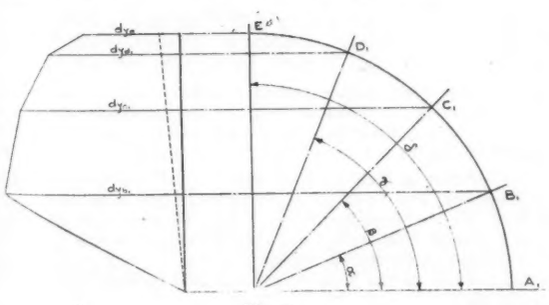


Fig. 5.

From the foregoing results it would appear that a number of the guides can only bear downwards or upwards (according to the position they occupy on the windward or leeward sides of the gasholder) by the flexibility of the bottom curb; and observation from actual examples appears to confirm this. In all spiral holders the wind not only causes an overturning moment in the bell of the floating holder, but also a horizontal force acting in the plane of the rollers. Careful thought will show that the reactions at the rollers are really dependent on many variable factors which are indeterminate and not constant from day to day. A strict treatment should take into consideration the variations in temperature, and the friction on the rollers and axles themselves. The clearances allowed to ensure the smooth working of the gasholder in its upward or downward course, and slight inequalities in the line of rail due to workmanship, rust, or wear, also affect the stresses. It has to be realized that a gasholder bell is in itself a comparatively light and flexible structure, which, even when provided with a guide frame, sustains temporary changes of form under the influence of a strong wind; and it is obvious that a spirally-guided bell behaves even less as a rigid cylinder.

These variable factors make it impossible entirely to determine the stresses upon purely theoretical grounds, and the calculated result must be qualified by special knowledge based upon observation and experience. Theoretical computations of the kind now under discussion form a useful basis up to a certain point, but need to be considerably qualified in practice by more or less empirical factors that are the result of long experience and precedent construction. Thus those structural gas engineers who have specialized for many years in gasholder construction have, by the study of actual examples over long periods, arrived at standard sizes of axles which, while amply strong to resist the stresses to which they are subjected, are not unduly heavy for the duty they perform.

CONSUMERS' COMPLAINTS.

By H. PERCY.

[A Paper read before the Midland Junior Gas Association on Feb. 21.]

We must take hold of each complaint, whether serious or trivial, immediately it is received, and follow it up until absolute satisfaction has been given. Only by doing this shall we retain our old consumers, and obtain new ones. Every consumer who is left dissatisfied is not only a "candidate for the other side," but will help to carry with him many of his friends.

Services of adequate size should be laid to all meters, and consideration must be given, not only to the immediate application for a certain amount of gas-apparatus, but also to the possibility of future requirements. The size and type of the building itself should be the deciding factor. To a certain extent, the same may be said regarding the meter and internal pipes; but, whereas (at least as far as Birmingham is concerned) the cost of installing these latter items falls upon other shoulders, the laying of the service, or at least some part of it, falls to the lot of the gas undertaking. But whoever pays, a good service should be laid in all cases, for, after all, as far as each individual building is concerned, this is the foundation of the supply. Though not an advocate of unduly long services, I strongly object to outside meter houses, and always avoid the use of them wherever possible. These places, though they may be strongly built, are often the cause of untold trouble and annoyance, not only to the consumer, but to the suppliers of gas as well. With four exposed walls and roof they are usually cold and damp, and after a time become defective. This is so especially with the doors—this one often finds. After a few years, doors do not close properly, and locks become damaged. The gas has been turned-off in these places on more than one occasion by mischievous boys. In severe wintry weather, the meter (which must be a wet one, as dry meters are unsuitable in such places) becomes frozen-up, and it is a terrible trial for a consumer to have to undertake the task of thawing the meter out in the open on a cold winter's night with, perhaps, snow on the ground. I have also found that when once a meter has been thoroughly frozen-up, it invariably develops an internal complaint, and has eventually to be changed. Again, the outlet pipe in most cases has to be laid underground from the meter to the premises, necessitating the fixing of a syphon, and, of course, further risk of trouble.

Though the life of a dry meter under ordinary conditions is less than that of a wet one, I am convinced that great benefit to consumer and supplier is gained by the use of the former. There is no watering visit necessary by the inspector, no leaky washers and consequent dampness round the meter, and, more important still, one seldom finds any trouble with water in the outlet supplies when a dry meter is installed. I have in mind the case of an estate containing 250 houses. These houses were built in 1915. A 1-in. service was laid to each house, and a 10-light dry meter fixed in each case. Internal pipes to a good specification were installed. The number of complaints received from this estate could almost be counted on one hand, excluding, of course, small cooker and fittings repairs. I give you this instance to show how little we are troubled with complaints when an adequate service, a dry meter, and good internal pipes are installed. Each house contains seven lights, gas-cooker, wash-boiler, and in many cases gas-fires.

A dry meter can also be considerably overworked, without much risk of failure of the supply. This cannot be said of the wet meter with a float, for, should the water line be a little low (or sometimes even at the correct level), and a bigger load is required than the actual capacity of the meter, the float will probably drop, and cut-off the supply. It may be argued that someone is at fault for having a meter installed which is not capable of supplying the demand; but it is not always possible, or even wise (for the larger the meter the greater the capital outlay for the supplier, besides the extra cost of fixing), to fix a meter to supply a load which perhaps cannot be foreseen with any degree of certainty, and is only likely to occur very rarely. With a dry meter, however, little risk of trouble is incurred should this contingency arise.

We are very rarely troubled with complaints connected with the large cylindrical wet meters, no doubt owing to their simple

construction and the absence of a float. It is really remarkable, considering the constant work which most of these meters are called upon to perform, how seldom it is necessary to repair or change them. Many of them have been in use without mishap for twenty or thirty years, and some for much longer than this. Nevertheless, though comforted by these facts, there is often a good deal of trouble with the supply pipes after the gas has passed through the meter. It is a good plan to make a point of keeping on good terms with the engineer-in-charge at all large works and institutions; and though, of course, they are invariably capable men, they are always glad of a little advice regarding gas installations, &c. Discreetly offer your assistance. If this is done, you will find that they will often come to you for guidance when any gas difficulty occurs. This is valuable, for one gets introductions, and confidence is placed in you, which means that you get many opportunities to prevent mistakes being made in running supplies and installing apparatus. Everyone will agree that, though our part of the contract may be in order, it is to our advantage that things should work smoothly after the gas has passed the meter, thus avoiding complaints. In addition, it will be found that much actual fitting work is obtained inside these larger works, &c., by adopting these methods.

Though many complaints are of a trivial nature, and can be remedied by men with ordinary knowledge and experience, I believe in selecting the best man possible to deal with complaints. Get a man you can trust completely in every way, and make him your complaint man. He will then bring to you his reports after the complaints have been properly investigated as far as his work allows; and, if necessary, these can be followed-up personally, without fear of being on the wrong track.

Two of the greatest steps forward in helping to reduce the number of complaints have recently been taken in Birmingham. One is the free clearing, renewing, or enlarging of services to consumers' premises when necessary. The other is the clearing, at a small nominal charge, of internal house-pipes. By the introduction of these schemes, our troubles have been considerably reduced, and the possibility of a continually recurring complaint, due to the same cause each time, has been eliminated.

I consider that, with the continued increase in the demand for gas in the home, the question of larger mains in some of the older roads will have to be tackled. Though the trunk mains may be large enough, the mains in stretches of roads between these, containing (say) 70 houses on each side, are in many cases inadequate. Assuming that each house contains a gas-cooker, which is not an unlikely proposition, each cooker on Sunday morning consumes about 40 c.ft. of gas per hour, making a total of 5600 c.ft. Many gas-fires will also be in use during the winter months. With a 4-in. main—which is the usual size found in these roads—a consumption such as this causes an appreciable drop in pressure; and I consider the time will come when larger or duplicate mains will have to be laid in these cases in order to avoid complaints of low pressure. If the figures quoted included those for gas-fires, which are daily increasing, the situation would appear much worse.

The question of complaints of escape is too serious to be overlooked, and it is not necessary for me to lay any stress on the need for immediate attention to be given to these as soon as received. Fortunately, with the more general use of iron pipes and solid-drawn tube fittings, we do not get so many serious cases occurring inside houses. Faulty workmanship or slightly defective fittings are now the cause of most of our trouble in this direction. If the makers could construct meters in which gas escapes from slot or index were less frequent, they would confer a great saving to the industry, as this is now one of the chief causes of escape complaints. Escapes from mains and services call for prompt action, and should not be left an hour without attention. The indicator now in general use is most valuable in these cases, and no man should be allowed to attend these complaints unless provided with an electric torch, as proper inspection of cellars and buildings cannot be made in the vicinity of the escape without some light other than a naked flame.

A short time ago, I had considerable difficulty in tracing the source of a complaint which we received of an occasional smell of gas in the road and house. Each time we attended, there was no sign of gas; but we ultimately found the smell was due to some process being performed at a rubber factory in the neighbourhood, which caused a vapour, having an odour similar to that of coal gas, to float about in the atmosphere.

At the end of each quarter a number of complaints is received from consumers regarding their gas accounts. These should be treated very seriously, and it is wise to endeavour to find out the real cause of increased bills, for they are often complained about. It may be obvious to the investigator that the gas charged for has been used; but it only does harm merely to tell the consumer that everything is in order, the meter is all right, &c., without giving some satisfactory explanation. An endeavour should be made to find out the real cause. Let the consumer feel that the call is not merely made to persuade him that all is well, and that he must pay up. Ofttimes, there is some cause which may have been overlooked by the consumer, such as a change of maid, or a case of illness, necessitating an increase in the use of a gas fire and lights. Take the reading of the meter, and call again in the course of a few days to see how the consumption compares with the average daily consumption during the period in dispute, not forgetting, of course, to pay regard to weather conditions. Test for soundness of the installation, and test some apparatus in the house, the consumption of which can be fairly accurately estimated. After careful investigation on these lines, one can soon judge as to whether there is any serious defect in the registration of the meter. In any case a consumer will be much more contented than if his complaint is dealt with in an off-handed manner.

When dealing with this type of complaint, I consider that, if the fact that it is not the gas used for lighting which causes what appear to be heavy bills, but more likely that used for cooking and heating, was impressed upon the consumer, the continued use of gas for lighting would be made more certain. We often find that consumers, in an endeavour to reduce a gas bill, will cut down their lighting to such an extent as to make it insufficient to give good service, whereas little effort is made to economize in the use of gas at the cooker, which, after all, is the apparatus which usually accounts for the biggest proportion of the consumption. There should be no difficulty in proving to a consumer that the gas used for cooking and heating is giving good value for money. This argument will invariably satisfy the consumer—that it is not the lighting which is causing heavy gas bills—thus helping to keep him contented with gas for lighting. The other apparatus can hold its own against all forms of competition.

Mr. Percy then gave some figures relating to complaints received during one week in a certain district. Out of a total of 192 complaints, 87 were directly or indirectly connected with meters. Of these, 49 were attributed to wet meters (which would not occur with dry meters), 2 complaints were connected with dry meters, and 36 were due to causes which might arise with either type. Of the latter 36, 9 were due to escapes at slot, index, or case, necessitating a change of the meter in most cases. They were therefore costly items, requiring two visits by a fitter, and a double visit by the delivery van.

Discussion.

The CHAIRMAN said that the complaint department was one of the most important connected with the distribution and sale of gas. If properly controlled, it was a very useful channel whereby the sale of gas might be materially increased. A gas undertaking, through the complaint system, was enabled to get into close touch with consumers; and it was the duty of everyone fully to realize that, as a public utility supply, they were under an obligation to see that consumers were well satisfied. Complaints carefully investigated and attended to generally revealed the fact that they were justified.

Mr. L. STURDEE (Birmingham) observed that a large number of the complaints in his district were due to old pipes in old property, where continual stoppages occurred.

Mr. W. S. SPINKS (Birmingham) said it was most important that complaints should immediately receive attention. It had to be remembered that many persons thought over a complaint for a long time before making it in official quarters. He queried the suggestion of any appreciable fall of pressure in a 4-in. main with a consumption of 5000 c.ft. of gas.

Mr. S. W. SIMMONS (Dudley) was of opinion that the life of a wet meter was longer than that of a dry one.

Mr. CURRIER (Smethwick) asked if distribution members had had any experience of "Armco" iron service pipes.

Mr. H. PRICE (Birmingham) inquired what was a safe margin for overloading on dry and wet meters.

Mr. W. B. COBB (Birmingham) said that many serious complaints were due to defective flues.

Mr. PERCY replied to a number of points raised. He had had no experience of "Armco" iron service pipes. He agreed that flue deposits were becoming very serious.

Will.—Mr. Henry S. Freeman, civil engineer, a Director of the Wandsworth, Wimbledon, and Epsom District Gas Company, who died last January, aged 81 years, left £33,162 (net £32,698).

A Useful Slide Rule.—Messrs. Samuel Cutler & Sons, Ltd., have brought out a useful little slide rule, by which, knowing the cubic feet of gas made per ton of coal, and its calorific value, the number of therms per ton of coal can be immediately arrived at.

Institution of Welding Engineers.—A lecture entitled "Steel: Its Properties and their Relation to Welding," is to be delivered by Prof. F. C Thompson, B.Sc., D.Met. (Professor of Metallurgy at Manchester University, and Vice-President of the Institution of Welding Engineers), on Monday, March 17, at 7.30 p.m., in the lecture theatre of the Municipal Technical School, Byron Street, Liverpool.

The Illuminating Engineering Society.—A meeting of the Society will be held at the Royal Society of Arts, Adelphi, on Friday, March 21, when discussions on "The Use of Light for Outdoor Advertisements" will be opened by Mr. G. P. Corbett, and on "The Use of Light in Shops, in Shop-Windows, and for Display Purposes" by Miss M. Partridge, B.Sc.

Swansea Ingenuity.—A novel idea on the part of the Swansea Gas Company has resulted in an advertisement for gas which will impress Swansea townsfolk. This new propaganda is in collaboration with a local bookseller (Mr. A. R. Way) who is advertising a new edition of Mrs. Beeton's "Cookery Book." He has opened a new shop in the heart of the shopping centre, and his window at present contains a gas-cooker inset, as it were, in Mrs. Beeton's new edition. Showcards draw attention to the fact that all the recipes enumerated in the cookery books can be cooked to perfection by gas. The strange sight of a gas-cooker in a bookseller's window is resulting in good business to the "combine."

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING.

THERE was a fairly large attendance at the 54th annual meeting of the Institution, held on Friday last, in the Midland Hotel, Manchester. Mr. R. E. GIBSON, Chief Engineer to the Liverpool Gas Company, presided over the first part of the proceedings. A luncheon preceded the business meeting. Mr. Gibson was supported by Mr. G. S. FRITH, J.P. (President-Elect), of Runcorn.

NEW MEMBER.

The minutes of the previous meeting having been confirmed, a new member was formally received—Mr. T. H. Williams, Engineer and Manager, Crewe.

ANNUAL REPORT AND BALANCE-SHEET.

The PRESIDENT moved the adoption of the annual report and statement of accounts.

The report stated that the membership stood at 205, an increase of 2. The Committee regretted the loss by death of Mr. William Chew, of Blackpool. Touching the reports of the Lancashire and Yorkshire Commercial Sections, the report had this comment:

> These Commercial Sections are carrying out a most important work in a very necessary sphere of labour, and every gas undertaking, whether large or small, must benefit very largely by the information that is conveyed to the members at their monthly meetings.

The statement of accounts showed that the balance in hand at the beginning of the year (£22 2s. 6d.) had been increased to £28 10s. 6d. The total income for the year was £136 18s. 4d.

The PRESIDENT said he regarded the accounts as satisfactory.

Mr. W. HILL (Stalybridge) seconded, and the resolution was approved.

SYMPATHY WITH THE TREASURER.

The PRESIDENT, at this point, said he had heard that the Hon. Treasurer of the Institution (Mr. T. Banbury Ball, of Rochdale) was ill. He therefore moved a resolution expressing sympathy with Mr. Ball in his illness, and the Institution's hope for his speedy recovery. At the same time, he hoped that some flowers would be sent from the meeting to Mr. Ball as a token of their sympathy.

Mr. C. S. SHAPLEY (Leeds) seconded the proposal (which was at once approved), and suggested that fruit would be more appropriate than flowers as an indication of sympathy.

REPORTS OF COMMERCIAL SECTIONS.

Mr. S. MEUNIER (Stockport) presented the report of the Lancashire Commercial Section, of which he is Chairman. Members of the Institution had had copies of the report, and would be able therefore, he said, to form their own opinion of the work of the Section during the past twelve months. There was one point to which he desired to draw particular attention, and that was the work of the Coke Pool. In the previous year they had only had a few months' experience, but the work had grown very much in the year just ended. He must say it had operated extremely well. In this connection, he desired to offer up a little meed of praise to their friend, Mr. Ernest Parry, of Oldham (the Hon. Secretary to the Section), for the amount of work he had done in regard to this particular item had been simply enormous. It had all been very well done, at a great deal of inconvenience, and, one was afraid, some detriment to Mr. Parry's health. They might judge somewhat the magnitude of this business when they saw that telephone charges came to £39 odd. He was pleased to say that, now they had their experience and knowledge of how to go about it, they hoped the work, and the expense attending it, would be considerably reduced. But the effect of this Coke Pool he did not think had been quite realized. They were now in a position to judge what the actual requirements for coke were in their own immediate districts; for the fact of clearing off the surplus coke to a new channel, or market, had prevented that inter-rivalry between town and town, and stopped a great deal of what he had argued about—namely, the non-necessity of undertaking the selling of their coke irrespective of where it was going. They had found, when they began to clear their surplus coke away, their normal demand increased enormously, due to the diminished contribution from other districts and undertakings Now it seemed to him what they ought to do was to take all possible steps to keep their own internal trade, and increase it as much as they possibly could. That they should keep to the surplus coke, and that alone, was, he thought, the idea. Had they taken advantage of the prices which were easily obtainable, it would have amounted to this—that they would have starved their own localities to get increased money. This the Committee did not believe in, and therefore all that was parted with was actual surplus; and if they kept to these lines, he thought most of his hearers would find that the coke they were making could be sold in their own areas, and the total amount of surplus coke in the country would be much smaller than people had realized in the past.

Mr. E. H. HUDSON (Normanton), in the absence of Mr. Charles Wood, of Bradford (Chairman) presented the report of the Yorkshire Commercial Section. Good prices, he said, had been secured by the combination represented by the Section. Their coke they sought to dispose of in their own district, and any surplus there was they got rid of by shipment, so that the price was where it was—commensurate with the value of the coke—and not as it might have been if they had not taken advantage of the shortage. There was no doubt at all that this Section was a powerful agent for good, for by it members were kept cognizant of values, which changed from time to time. The Yorkshire Section had suffered very seriously by the retirement from active work of Mr. Harry Townsend, of Wakefield, and his removal South. They all wished him health and happiness.

LETTERS OF APOLOGY.

The HON. SECRETARY (Mr. William Rogerson, of Middleton) read letters of apology for absence.

On the motion of Mr. SHAPLEY, the meeting agreed that the Secretary should send a letter to those members whose absence was due to illness, expressing regret and a desire for speedy recovery.

RECOMMENDATIONS.

It was decided, on the proposal of the President, to give £10 10s. to the Benevolent Fund of the Institution of Gas Engineers; that Mr. Harold Davies (Chesterfield) be re-appointed the representative of the Manchester District Institution on the Council of the Institution of Gas Engineers for 1924-25; and that Messrs. W. Buckley (Manchester) and F. H. Robinson (Harrogate) be appointed the representatives of the Institution on the Councils of the Lancashire and Yorkshire Junior Associations respectively.

SUBSCRIPTION INCREASED.

Mr. SHAPLEY then moved—"That the subscription of this Institution be increased from 10s. 6d to £1 1s. per annum; the subscription to include a copy of 'Transactions of the District Institutions.'" He knew, he said, the members did not want to be behind those of other District Associations in this respect, and as the proposed increase did not quite cover the cost of the "Transactions," all would see the reasonableness of the proposition. They needed a record of their proceedings which could be handed down to future members.

Mr. R. H. GINMAN (Leek) seconded the motion.

The PRESIDENT said he would like to support the proposal very strongly.

Mr. G. W. TOOLEY (Manchester) failed to see the reasonableness of the proposition, and moved as an amendment—"That the subscription be kept at the present rate, and that it be at the option of every member to pay for a copy of the 'Transactions' if they desire it." He thought the only justification one could have for increasing the subscription, or altering a section of the bye-laws, was that the funds were too low. As to that, they had heard the balance in hand was larger than it was a year ago. Regarding the securing for each member of a copy of the "Transactions" of the various Associations, whether he required it or not, in his opinion not 50 p.ct. of the members needed these copies, and it was a moot question whether when they got them they read them at all. Even if they did read them, it would only be because they had contributed to the "Transactions," and wanted to see their names in print. [Laughter.]

As there was no seconder to the amendment, the President put the resolution to the meeting, and it was carried with only one dissentient.

INDUCTION OF THE NEW PRESIDENT.

Mr. GIBSON said it was with very great pleasure that he rose to induct to office as their President for the coming year Mr. G. S. Frith, of Runcorn. No one in the Institution was more widely known or more respected than Mr. Frith. ["Hear, hear."] Mr. Frith had well earned the honour which the Institution now conferred upon him. As Hon. Secretary he served the Institution faithfully and well for many years. Indeed, he was a model Secretary, and members of the Institution owed a great deal to him for the smooth working and the present prosperous condition of the Institution. Since Mr. Frith retired from the office of Secretary, he had been a member of the Council, and had given them valuable assistance in this capacity. Mr. Frith had always shown a keen interest in all the affairs of the industry, not only locally, but nationally. He had been on the Council of the Institution of Gas Engineers for some years. He was also a member of the National Gas Council, and on many Committees he had done good work, and they had had the advantage of his sound judgment. Now for the first time, Mr. Gibson believed, in the annals of this Institution they were to have a Justice of the Peace to preside over their deliberations. They congratulated Mr. Frith on his distinction, and themselves on their being about to elect him as their President. He had very great pleasure indeed in asking Mr. Frith to preside over the Institution's

proceedings from now onwards to the end of the current year. [Applause.]

Votes of Thanks.

Mr. G. S. Frith (Runcorn) then took the chair, and was greeted with loud cheering. He said his first duty was a most pleasing one—to move a vote of thanks to the retiring President, Mr. Gibson, for his conduct in the chair during the past twelve months. Mr. Gibson always did the correct thing, and at the right time. ["Hear, hear."] He had made an ideal President, and those members who were privileged to visit Liverpool last year would not readily forget the enjoyable day they spent there.

Mr. H. Davies (Chesterfield) said he had very great pleasure in seconding the proposal. It was not often that they could expect men occupying the responsible position that Mr. Gibson did in Liverpool to give the time needed to preside over the affairs of the Institution for twelve months; but Mr. Gibson had done it, and they desired to assure him of their profound appreciation of his services.

The resolution was unanimously passed.

Mr. Gibson assured the meeting that he appreciated highly the vote of thanks that had been accorded to him, and the kind terms in which it had been proposed and seconded. He had felt it a great honour to occupy the position of President. His only regret was that his duties at Liverpool were of such an exacting nature that he had not been able to devote all the time he would have liked to do to the Institution. But what he had done he had been very pleased to do, and he had done his best, in somewhat difficult circumstances.

Mr. Frith then delivered his

PRESIDENTIAL ADDRESS.

Gentlemen,—When I was elected a member in 1898, I little thought that in course of time I should be appointed your Honorary Secretary, and later be invited to occupy the position I do to-day as President of this District Institution, which is the oldest, and one of the most important, of the organizations affiliated to the Institution of Gas Engineers. In accepting the office (which I do not take up lightly, and without due regard to its importance), I feel I cannot adequately convey to you my thanks for the high honour you have conferred on me; and I trust that during my term in the chair I shall be able to maintain the lofty ideals so ably established by my predecessors. As Engineer and Secretary of two undertakings, having a joint make of approximately 150 million c.ft. of gas per annum, I hope to interest, and possibly help, some of my colleagues in medium-sized works by recounting some of the problems encountered during my period of management.

Historical.

The first Runcorn Gas Act was obtained in 1837 for the lighting of the town by "inflammable air or gas" for "the safety and advantage of the inhabitants residing within the said town." It is evident that full advantage was taken of the powers then obtained, for ten years later—1847—another Act was granted by Parliament "for the better lighting" of the town, together with a much larger area of supply, including the parish of Widnes. You may marvel at the optimism of the Consulting Engineer of those days when I draw your attention to the fact that it would have been necessary to lay mains across the bed of the River Mersey (which is a strong tidal waterway) to carry this into effect. These powers were never exercised; and they lapsed in course of time.

During the construction of the Manchester Ship Canal, which undertaking passes through Runcorn on the Cheshire side of the Mersey, the use of gas developed to such an extent that new works were considered necessary; and these were erected on a much larger and more convenient site, which should be ample to supply the requirements of the neighbourhood for many years under normal development. The new works were brought into operation in 1894, and were carefully laid out for easy extension; the retort-house being stage-floor, fitted with up-to-date regenerator furnaces, which were then coming into general favour. The retorts were of oval shape, 21 in. by 15 in. by 20 ft long, and were hand-charged. The Livesey washer, tower scrubber, exhausters, purifiers, and other portions of the plant were all designed for a maximum make of 1 million c.ft. of gas per day.

Reconstruction of Retort-House.

The working results gave every satisfaction for several years; but with the change-over from twelve-hour shifts for stokers and boiler men to eight-hour shifts, and other improved conditions granted to workers, the production costs increased to such an extent that, in 1914, I recommended my Board to consider the advisability of installing vertical retorts, or re-modelling the retort-house for stoking machinery. After visiting several works, where verticals and stoking machinery had been installed, and carefully considering the capital outlay, it was decided to reconstruct the existing retort-house—having regard to the fact that it was 70 ft. wide, 120 ft. long, and 22 ft. high from the stage-floor to the eaves of the roof, which would allow of the easy fixing of any type of stoking machinery. An order was eventually placed with Messrs. Drakes Limited, of Halifax, for one of their projector-type combined stoking machines; and in addition to the existing bench of six through beds of six semi-⌂ section retorts, 22 in. by 16 in. by 20 ft. long, a contract was entered into for the erection of a new horizontal bench of retorts consisting of four through beds of six semi-⌂ clay retorts 22 in. by 16 in. by 20 ft. long, in each bed, complete with hydraulic mains, on both sides of the bench, fitted with Cort's anti-dip pipes, 6-in. ascension pipes, tar tower, &c. In addition, coal breaker, elevator, and overhead hoppers were provided. Owing to the small quantity of coke likely to be dealt with, conveyors were not installed; but the retort-house is so designed that they can be introduced when the size of the works warrants it. Figs. 1 and 2 show the general arrangement of retort bench with coal handling plant. A Browett-Lindley high-speed steam engine, coupled to an 18-kw. compound-wound direct-current dynamo, was installed to provide the power required for the motors on the stoking-machine, and also for the coal-breaker and elevator motors.

This reconstruction work was delayed by the outbreak of the war, but was eventually completed; and the plant was brought into operation in February, 1915, when the President of the Institution of Gas Engineers (the late Mr. Edward Allen, M.Inst. C.E., of Liverpool) performed the opening ceremony. Imme-

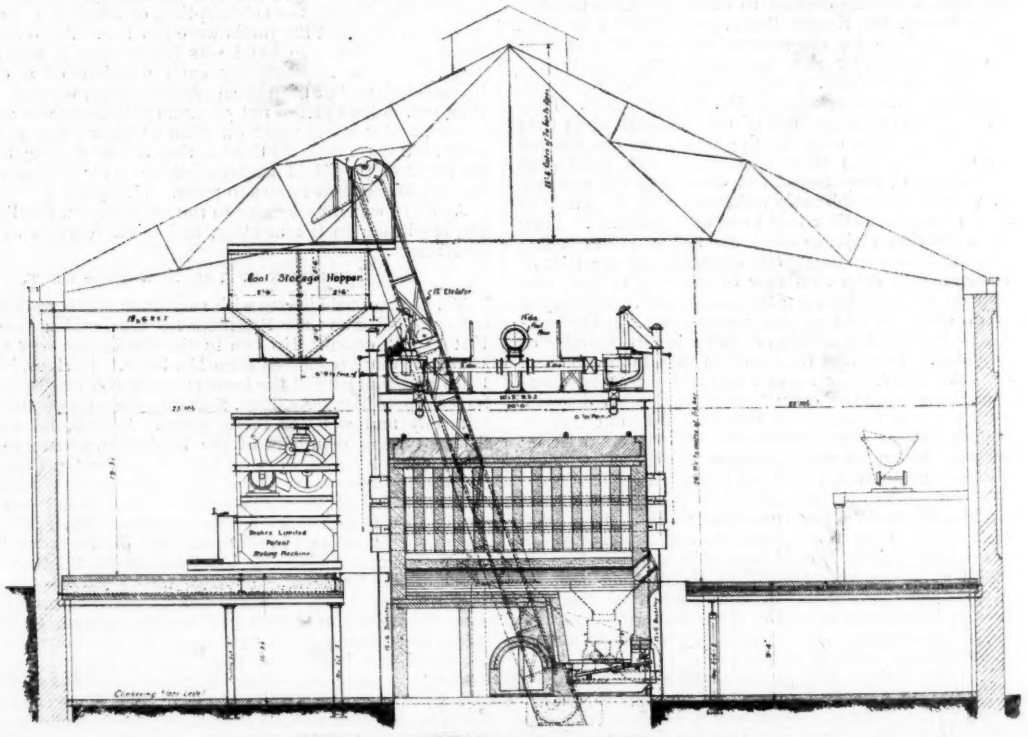


FIG. 1.—CROSS-SECTION OF RETORT-HOUSE.

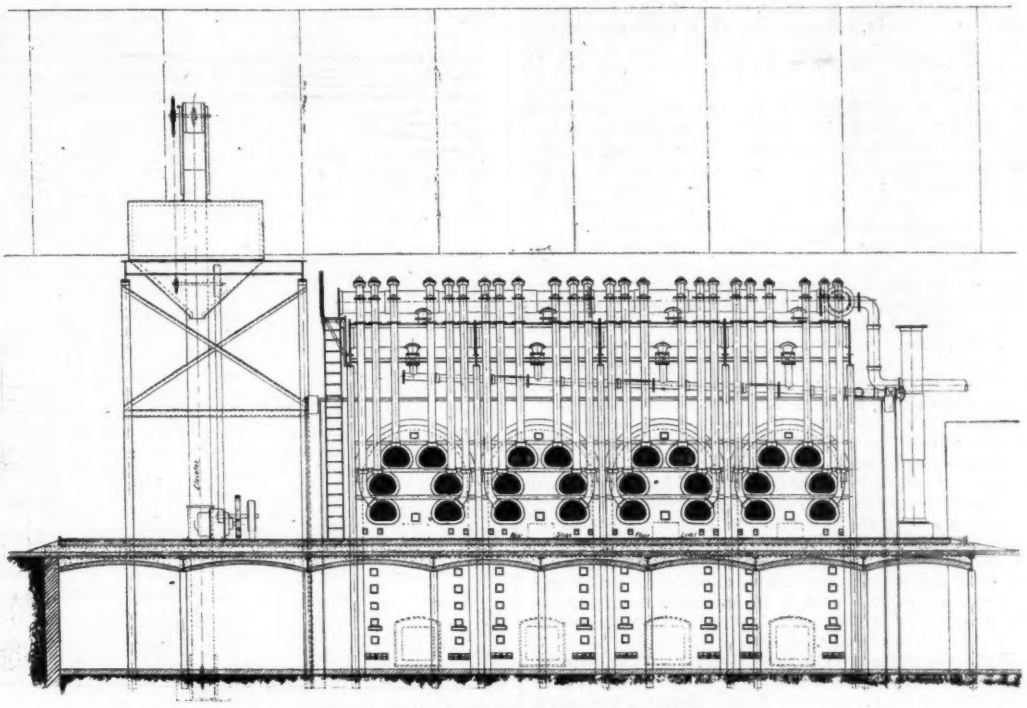


FIG. 2.—FRONT ELEVATION OF SETTINGS.

diately this plant was brought into operation, improved results commenced to accrue; and when the military authorities began to make demands on our men, they were released without much inconvenience, for the number of stokers had been reduced from fifteen maximum to six maximum—a saving of nine men in the retort-house alone; the shift work being re-arranged from three eight-hour shifts of five men each to two eight-hour shifts of three men each, with intervals of four hours between each change of shift. The weight of charge at the same time was increased from 7 cwt. per through retort of the same section and length to 12 cwt., and the weight of coal dealt with per stoker was increased from 2·1 tons to 5 tons, which resulted in a saving of approximately £1500 per annum in carbonizing wages—equivalent to 3s. 4d. per ton of coal carbonized. The make of gas per ton of coal carbonized was also considerably increased; but as war conditions prevailed soon afterwards, and the quality of fuel was much inferior to the pre-war quality, I have refrained from giving any comparative figures over these intervening years.

OVERCOMING DIFFICULTIES.

The change-over from one system to another in any process of manufacture naturally brings with its introduction some unforeseen difficulties; and I think I should briefly bring these to your notice, and explain how they were dealt with. It was quickly observed that the temperatures in the settings were not as regular as they should have been; and this defect had to be traced and remedied without delay. The explanation is a simple one. Prior to the introduction of the stoking machine, all the retorts were hand-charged; and as the stokers had always been instructed to keep the furnaces well filled with coke, and these were replenished every two hours (after each charge), the production of carbon monoxide in the producers was kept very constant, and no trouble was experienced in the heating. Immediately the stoking machine was brought into operation, however, and the carbonizing period extended from six to twelve hours, the furnaces could then only be filled with hot coke from the top retorts every six hours. During this extended period the fuel in the producers dropped to a very low level, with consequent irregular heating in the setting. To aggravate matters, the dense and large coke made from the well-filled retorts did not lie so closely in the producer as formerly, with a result that the primary air rushed through the voids so created, quickly converting the carbon monoxide into carbon dioxide, and causing extensive damage to the producers. A remedy was quickly applied; the producers being replenished at more frequent intervals, by using some of the coke from the middle retorts instead of depending entirely on that from the top tier.

STEAMING.

During the war period steaming was successfully carried out on this plant. Having Cort's anti-dip pipes on the hydraulic mains, it was an easy matter, by closing the dip-pipes on one side of the bench, to make all the gas produced travel up the remaining ascension pipes. The steam was admitted at the opposite end to the gas off-take, and had to pass through the mass of hot coke. This could be varied at will during the period of carbonization. While the process was in operation, the retorts were packed as full as possible with coal, and carbonized for 24 hours; steaming taking place during the latter half of the period. In 1918 and 1919, when this process was extended to its full capacity, monthly average makes of 480 B.Th.U. gas reached as high as 14,607 c.ft. per ton of coal carbonized. The drawback to the system was that the throughput per retort was considerably reduced, with a consequent increase in wages cost. During the period of this experiment, however, this had to be ignored, for it was purely a question of conserving the coal as much as possible.

Since the introduction of heavy charges of coal in the retorts no trouble has been experienced with stopped ascension pipes. Not a single pipe has been taken down since 1914 for cleaning purposes, which is very different from our previous experience under the old conditions of light charges and hand stoking.

GENERAL WORKING OF RETORT-HOUSE.

The exhauster is adjusted to maintain a vacuum of 2 in. of

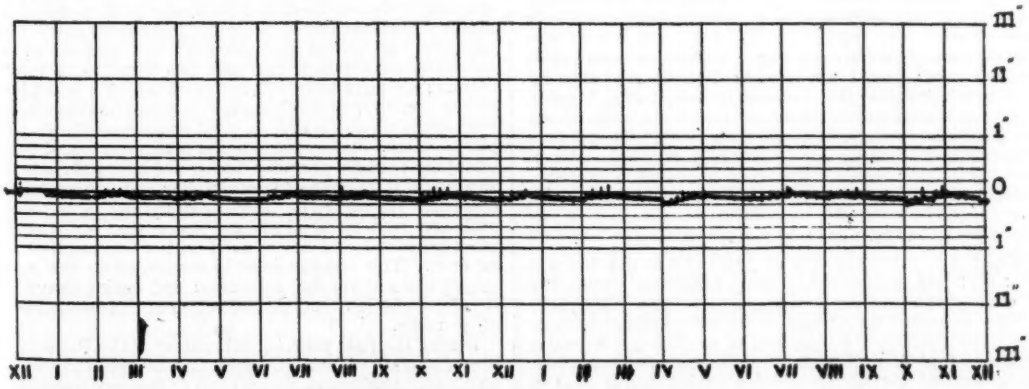


FIG. 3.—WORKING RECORD OF FOUL MAIN.

water up to the retort-house governor, which is then reduced to approximately 15-100ths in. vacuum in the foul main and interior of the retort; there being no seal on the dip pipes during the period of carbonization. Fig. 3 shows how evenly this can be maintained over the 24 hours. The greatest care is exercised to see that the "pull" on the retorts is not exceeded at any point during the carbonizing periods, so as to avoid the slightest risk of any producer gas being drawn through the porous walls of the retorts. As the average of the inerts in the gas supplied in the district does not exceed 13 p.ct., it is evident that effective exhausting is consistently maintained, which, as I think every member will agree, is important to secure good carbonizing results.

Recently I noticed in one of the technical journals diagrams indicating the difference between the varying qualities of gas produced during the period of carbonization in horizontal settings and continuous verticals, much to the disadvantage of the former system. I feel confident that this result was more the fault of the working of the plant than the system, as, given careful supervision and regularity in charging the retorts, I see no reason why a uniform quality should not be maintained from horizontal settings during carbonizing periods. The old adage that "Dividends are made in the retort-house" is as true to-day as when written years ago; and it behoves every engineer to watch development in carbonization as keenly as possible.

As every setting of retorts varies in its heating, I have for several years kept a careful record of the damper openings, and positions of primary and secondary air slides to the producers. This information is most useful when lighting up the beds after they have been let down for repairs. Samples of flue gases are taken from time to time, and careful observations made to check any by-passing of producer gas. Owing to the high temperatures now being maintained in our settings, I am gradually discarding fireclay retorts for those containing a high percentage of silica. Two beds of through retorts 22 in. by 16 in. by 20 ft. long of semi ⌂ section, have recently been brought into firing; the retorts in one bed containing 80 p.ct. of silica, and those in the other bed containing 90 p.ct. Both settings are so far working satisfactorily; but, as this is the first winter season under firing, it is too early to state how they will stand up to the strain of the discharging ram. I should be remiss if I omitted to mention at this juncture the important work accomplished by the Chairman and members of the Refractory Materials Committee of the Institution of Gas Engineers, in their earnest endeavours to improve the qualities of refractories.

Apart from the dust created in the retort-house, I am fully satisfied that for an undertaking of our size, a projecting type of charging machine is preferable to any other form, for it enables varying weights of charges to be adopted to meet sudden changes in consumption, thereby avoiding the necessity of having to light up an extra bed of retorts to carry over a very short period.

Recently I have reconstructed one of our producers. The usual angle-bars forming the furnace bottom have been taken out, and the bearers re-set, so that the bars now rest at an angle of about 32°, leaving a space of about 18 in. between the end of the bars and the back wall of the producer. I am so satisfied with the working of this arrangement that the other producers will be altered on similar lines without delay. Clinkering has been reduced to a minimum; and so far it has not been necessary to remove any of the bars, for the clinker can easily be pushed over the ends of the furnace bars and extracted with a shovel from the ashpan. A sketch of this arrangement is shown, fig. 4.

The easy manipulation of this type of furnace is in marked contrast to the trouble experienced in clinkering the furnaces of the earliest types of generator settings years ago. I can well remember that, to break up the mass of accumulated clinker, the firing of shots of powder into the furnaces had frequently to be resorted to. It is our practice at the Runcorn and Frodsham Works to remove the ashes from the subway with as little delay as possible after the usual clinkering of the furnaces, as it has been found from experience that the steam and the sulphur fumes arising from the ashes are rapidly drawn by the draught of the chimney through the secondary-air slides of the furnaces, causing in course of time serious damage to the regenerator flues and the adjoining brickwork in the lower part of the setting.

The subject of carbonization is undoubtedly the most fascinating part of a gas engineer's work; and I am pleased to think that my father was one of the pioneers in generator firing over forty years ago.

A wise expenditure of capital upon works modernization is a most profitable investment; and I am sure my Board have never regretted the amount spent on the carbonizing plant during 1914-15. With the great improvements made in continuous vertical retorts during the past few years, it is more than likely that developments in the future will be largely on this type of plant. Whatever its drawbacks, this system possesses a charm in its cleanliness and ease of manipulation that must appeal to every gas engineer.

WATER-GAS PLANT.

A Tully plant of a rated capacity of 300,000 c.ft. per day was installed in 1920; and this proved of great assistance during the prolonged coal strike in the spring of 1921, and fully justified, and amply recouped the Company for, the small capital outlay involved in its erection. As the cost of producing blue water gas now exceeds that of producing straight coal gas, this plant has not been worked for a considerable period, but is held in readiness for any emergency.

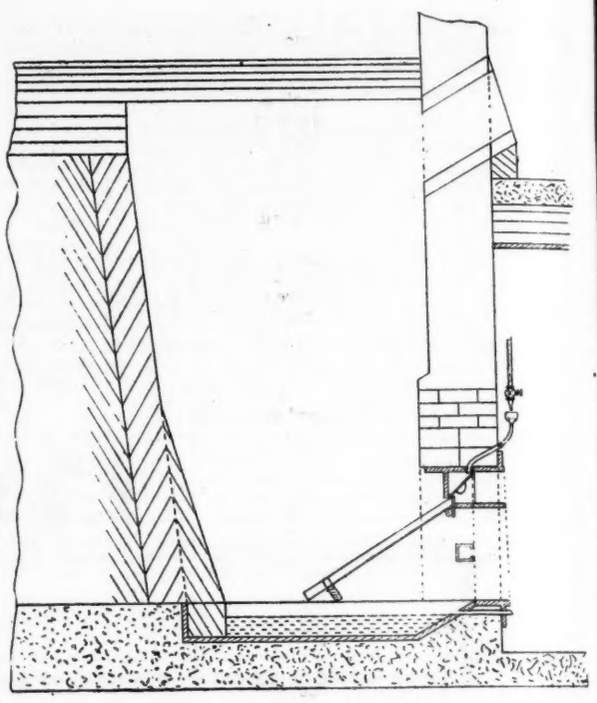


Fig. 4.—Section showing Alteration to Producers.

CALORIFIC VALUE.

From the experience gained during the past few years with qualities of gas varying from 425 to 500 B.Th.U., I believe the gas best suited for the requirements of the consumers in this district to be 500 B.Th.U., which is the declared calorific value of the gas supplied in both the Runcorn and Frodsham districts, both undertakings using similar qualities of fuel.

BENZOLE.

At the request of the Ministry of Munitions, a benzole plant was erected at the Runcorn Works, and brought into operation in July, 1917. A "Holmes" rotary washer of 750,000 c.ft. capacity per day was fixed between the purifiers and station meter; and an extraction of 1½ to 2 gallons of crude benzole was obtained per ton of coal carbonized. The washing medium was creosote oil, and the de-benzolizing was carried out in a "Southport" type of still. With such a high stripping of the gas, naphthalene very quickly made its presence felt all over the area of supply, and was difficult to cope with. Since adopting heavy charges of coal in the retorts, naphthalene troubles have considerably decreased; and as no appreciable test can now be obtained on the works plant, it is obvious that a quantity has been lodging in the holders and mains, which is still giving occasional trouble. It is my intention to put one of the holders out of action during the year, and to clean out thoroughly the inlet and outlet pipes, and also the interior of the holder.

Though benzole extraction was an interesting process, it was calamitous from the gas industry's point of view, as the stripped gas played havoc with the leather diaphragms of the dry meters, and in the case of the Runcorn Company the repairs have been far in excess of pre-war years. Our experience, I know, is common to most other undertakings, as a cursory glance at the costs in the "Gas World Analyses of Accounts," under the heading of "Maintenance of Meters" quickly shows.

DISTRIBUTION.

During the war period the mains could not receive the careful attention they required, and naturally in the growing areas of our district the consumption in several instances exceeded the delivery capacity. Extensive enlargements and looping of mains have been carried out over the past two years, with most beneficial results; an extra supply being available at a considerably lower works pressure, with consequent less gas unaccounted-for.

There is no doubt that in most cases complaints as to bad gas can be traced to the fact that the mains are insufficient in size to maintain a steady pressure during the heavy periods of demand; and this is a point that deserves the careful investigation of every engineer. In one of our low-lying districts in the Runcorn area a booster was installed several years ago; and this has proved most beneficial, and has worked with a minimum of trouble and expense. The booster inlet is connected to the ordinary 6 in. supply main of varying pressures; and during heavy load periods it is brought into action, and set to maintain an outlet pressure of 30-10ths.

During the past year, the laboratory at the Runcorn Works has been re-arranged and enlarged, and is now fully equipped with up-to-date appliances, to conform to the requirements of the Gas Referees under the Gas Regulation Act, 1920. Provision has also

been made for ready tests of complete gas analysis, and on coal, tar, spent oxide, ammonia, and for the other tests required on a works. It is to be regretted that the question of inaugurating a central laboratory in Manchester, or other convenient centre in this Institution's area, had to be abandoned by your Council, owing to financial and other reasons. As this scheme was not feasible, a number of engineers offered facilities for students or assistants of smaller undertakings to attend their works for instruction; and I need hardly say how pleased my Board will be to grant a similar privilege to any applicant within easy access who would care to avail himself of this opportunity to visit the works at Runcorn.

A few months ago I was privileged to inspect some drawings illustrating the new tankless holder, together with a number of photographs of holders which have been erected on the Continent, and appear to be giving every satisfaction. It is evident that this system is receiving the serious attention of English makers; a Company having recently been formed in this country, the Directorate of which is composed of most of the leading makers of plant in our midst. The system is undoubtedly an ingenious one, and probably more will be heard of it in the near future. If the royalties are not excessive, it ought to command serious consideration, owing to the great constructional saving it will effect.

An interesting example of a concrete tank was completed and brought into action at the Runcorn Works in 1908. It is 32 ft. deep and has a diameter of 106 ft. As the timbering and general construction were carried out on original lines, my late brother was asked to read a paper before this Institution; and an illustrated description of the tank will be found in the District Association Reports for the year 1908.

NATIONAL GAS COUNCIL.

As one of your representatives on the Central Executive Board of the National Gas Council, I feel I must briefly refer to its work. The Council is particularly fortunate in having at its head Mr. D. Milne Watson, the Governor of the Gas Light and Coke Company, whose services so freely given since its formation have added very largely to the undoubted success achieved. He is also most ably supported by the officers, who at all times are ready to assist the members on any point that may concern their undertakings.

It would be impossible for me to refer in detail to the various questions vitally affecting the gas industry which have been dealt with by the Council; but the work accomplished in connection with the placing on the Statute Book of the Gas Regulation Act, and the individual advice given to a large number of undertakings in connection with their applications to the Board of Trade under that Act, are well known to every member of this Institution.

One of the disquieting features of the last few months has been the opposition to Orders promoted by gas undertakings under section 10 of the Gas Regulation Act. The Council is always anxious to place its services at the disposal of undertakings that may experience difficulty in their applications under this section, and will, I am certain, take such action as may be deemed necessary, with a view to safeguarding the industry. It is difficult to imagine what the position of the industry would have been but for the establishment of the National Gas Council and the Federation of Gas Employers; and these should, in my opinion, receive the support of every gas undertaking in the Kingdom—be it large or small, municipal or company owned.

COMMERCIAL SECTIONS.

The Lancashire Commercial Section of this Institution, though it commenced privately four or five years previously, celebrates its majority this year. It reflects greatly to the credit of Mr. S. Meunier (Stockport), who has been unremitting in his duties as Chairman since its formation, to chronicle the fact that there are to-day 81 members of this section—a number that has never been exceeded. The Yorkshire Section is also accomplishing excellent work under the able guidance of Mr. Charles Wood (Bradford).

The reports of the respective Sections have been circulated among the members, and they contain a record of most valuable work accomplished during the year. The fact of such a high percentage of attendance at the monthly meetings is proof, if any were needed, of the usefulness of this side of our work.

From the latest Board of Trade Returns I find that there is invested in gas undertakings in Great Britain no less a sum than £160,000,000, and that it is necessary to carbonize approximately 20,000,000 tons of coal per annum to meet the demands of our consumers. Gas engineers have undoubtedly great responsibilities attached to their positions; but I have no hesitation in saying that with the excellent organization of the industry, coupled with the energy and keen spirit displayed by our Junior Associations, we need have no fear for its future welfare. There are, without doubt, clear signs that gaseous fuel is quietly and surely taking the place of solid fuel for almost every domestic purpose, and is being used in increasing quantities for numberless industrial purposes.

THANKS TO THE PRESIDENT.

Mr. S. TAGG (Preston) said he had great pleasure in moving that a vote of thanks be accorded to the President for his exceedingly interesting and characteristic address. It was interesting, because it was a record of his experience as Engineer of two undertakings, which he believed would be of value to the members. In this respect the address was characteristic, because there was no one who had been actuated by a keener desire to promote the welfare of the individual member and the advancement of the Institution than Mr. Frith. Having some intimate knowledge of the services as Hon. Secretary that were rendered by Mr. Frith, he had confidence in saying that the Institution were undoubtedly under a deep debt of gratitude to him at all times. Mr. Frith was always solicitous for the welfare of the Institution, and spared no pains to secure that his work should be done with the greatest efficiency; and during the whole of the time he was Secretary, he was conspicuous by his desire to remain in the background—quite content to bear the strain, if he could ensure the successful working of the Institution. This feeling was reflected in the address, and one was sure it was appreciated by all the members.

Mr. W. WHATMOUGH (Heywood), in seconding, recalled his own experience of Mr. Frith's valuable work as a member of Council and Hon. Secretary, and in other capacities.

The resolution was passed with acclamation, and was suitably acknowledged by the PRESIDENT.

FORTHCOMING VISITS TO ELLAND AND RUNCORN.

The PRESIDENT, speaking of the programme for the year, said that arrangements had been made provisionally for holding the May meeting at Elland, and for a visit to Messrs. R. Dempster & Sons' works. As for the autumn meeting, he thought his directors would like the Institution to visit Runcorn.

Mr. J. MASON FRITH (brother of the President, and Chairman of the Runcorn Gas Company) gave the Institution a cordial invitation to visit Runcorn on the occasion of the autumn meeting. At the same time, he expressed the Runcorn Gas Company's high appreciation of the fact that their Engineer had been chosen for the office of President of the Institution. In that respect, the Company felt a little reflected glory. He did not think Runcorn had previously entertained an Institution of this description, but it was the first time they had had a Runcorn Engineer as President. Certainly they came rather near that honour when Mr. Harold Davies, now of Chesterfield, and formerly of Runcorn, became President. Though a little town, he thought Runcorn had something of interest to show visitors.

LONDON AND PARIS.

The PRESIDENT called attention to the forthcoming meeting of the Institution of Gas Engineers in London, and appealed to the members of the Manchester District Institution to make a point of attending and supporting Mr. Tagg, their fellow-member, in his position as President.

Mr. TAGG thanked the President for his kind words. It was upon the nomination of the Manchester District that he became President of the Institution of Gas Engineers, and he desired the support of his fellow-members at the meetings in London, and in the succeeding visit to Paris in compliance with the invitation of the French Gas Engineers.

On the motion of Mr. E. H. HUDSON (Normanton), seconded by Mr. F. V. BARNES (Todmorden), the thanks of the meeting were accorded to the officers and Committee for their services during the past year.

A LAUNCH ON TYNESIDE.

New Collier for the South Metropolitan Gas Company.

Last Thursday, the 6th inst., there was launched from the yards of the Tyne Iron and Shipbuilding Company, Ltd., Willington Quay-on-Tyne, the s.s. "Camberwell," a self-trimming collier built to the order of the South Metropolitan Gas Company. She is specially designed to comply with the Company's requirements as regards shipments of coal from Tyne to Thames, and is 244 ft. in length, 36 ft. 6 in. breadth moulded, 20 ft. 6 in. depth moulded, and will carry a deadweight of 2450 tons.

Mrs. Bywater, wife of Major F. J. Bywater, M.C., the Company's representative in Newcastle, performed the christening ceremony, and subsequently delighted the assembled guests at a tea in the decorated mould loft of the works with a graceful speech, in which she voiced the sentiments of all those present in wishing the best of good luck to the "Camberwell." Major Bywater expressed the regret of his Directors, and especially of the President (Dr. Charles Carpenter), at being unable to be present. He recalled that it was now getting on for a century since the South Metropolitan Gas Company started to draw coal from Tyneside.

Commander T. C. Anderson, R.N., Marine Superintendent to the Company, paid a tribute to the way in which the shipbuilders had carried out the work, and to the high standard maintained by the North-Eastern Marine Engineering Company, Ltd., who are to supply the engines for the ship.

Advertising on Gasholders in the United States.—The Tucson (Ariz.) Gas, Electric Light, and Power Company serve the oldest city of the United States—to which, within fifty years after the landing of Columbus, a charter was granted by the King of Spain. The Company have utilized their gasholder to advertise this interesting fact, by painting upon it, in bold characters: "Tucson, oldest city in the United States. Population, 30,000." The city has grown rapidly in recent years, and gas sales have gone up 30 p.ct. during the last twelve months. The Company are keeping fully abreast with these increasing demands, the manufacturing capacity of the gas plant having been increased by the addition of a new 500,000 c.ft. per day oil-gas generator.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Old Kent Road Works.

Considerably over a hundred members of the Association last Saturday afternoon took part in a visit to the Old Kent Road Works of the South Metropolitan Gas Company. This is always a popular fixture for the Association, who have paid a number of visits to the works. Assembling in the main offices, the members (who were accompanied by the President, Mr. Walter Grogono) were welcomed, on behalf of the Company, by Mr. F. A. Frost, the Superintendent of the Works, and were divided up into about a dozen parties for the tour of inspection. In addition to Mr. Frost himself, those who acted the part of guides, and during the afternoon imparted to the visitors a great amount of useful information, were Messrs. C. H. Belben, T. W. Gibson, V. P. Hart, L. J. D. Henly, J. Hewitt, W. King, F. C. Mitchell, K. O. Riddell, F. A. Sanders, H. C. Sims, and F. White.

It would be hard to say at which point in the tour the greatest interest was manifested, but there was reluctance to leave every one of the departments visited—and these included the gas manufacturing section, the chemical and physical laboratories, the burner shop, the demonstration room, the meter shop, and the stove and gas-fire assembling department. The laboratories deservedly excited admiration, and much attention was devoted to the large number of gas-heated furnaces, &c., to be seen in the demonstration room. Each succeeding process or piece of apparatus to which the members had their attention drawn served to impress still further upon them the great accuracy with which everything is done there, and the efforts that are made to secure standardization wherever possible, from a standard gas to a standard burner. It is to this, to a very great extent, that may be attributed the success achieved by the Company in connection with their lighting load. As to the manufacturing results, the following figures may be quoted from a booklet which was prepared for the occasion of the visit. The four retort-houses referred to are those now in use.

Average Makes of Gas and Products—Ten-Hour Carbonization.

Retort House No.	7	8	9	10
Weight per charge (cwt.)	10·5	10·5	10·5	11·5
Coal carbonized per 24 hours (tons)	200	200	200	220
Make of gas, therms	14,250	14,250	14,250	15,620
,, ,, per ton of coal carbonized			72	therms
,, ,, per retort			90	,,
Total gas made per 24 hours			58,370	,,
,, coal carbonized per 24 hours				820 tons
Standard calorific value of gas	560 B.Th.U. per c.ft.			
Specific gravity	0·420			

Products.

Coke made for sale per ton of coal carbonized	10·5 cwt.
Tar ,, ,, ,, ,, ,,	10·5 gallons
Liquor (8 oz. strength),, ,, ,,	42·0 ,,
(or the equivalent of 28 lbs. of sulphate of ammonia)	

The four modern retort-houses are each 150 ft. in length and 71 ft. wide, and are built in one block, with coal stores between, at right angles to the canal by which coal is brought in barges to the works. Each house contains, in settings of ten, 160 retorts, 20 ft. long and of oval cross section 21 in. by 15 in. (inside dimensions). The gas connections in each house are divided into units of four settings, each unit being separately equipped with a governor for vacuum control. When discharging and charging operations are in progress, the particular unit is for the time being worked under a reduced vacuum. Immediately the retort doors are closed, the vacuum is restored to that normally worked to. The weights on the governor bells are readily operated from the stage floor by means of a wire cable. Three of the houses are charged by machines of the West scoop type operated by compressed air, and the fourth (No. 10) by Arrol-Foulis hydraulic machines. The coke is discharged by the Hunter-Barnett hydraulic pusher.

The gas for heating the settings is generated in producers situated outside the retort-houses. There are two to each house, and when fully charged each generator contains approximately 40 tons of coke. They are charged at intervals of two hours from the overhead storage hoppers, each having a capacity of 25 tons. The coke supplied to each producer averages about 17 tons per 24 hours. The calorific value of the producer gas is approximately 120 B.Th.U. (gross) per cubic foot; and the analysis averages 29 p.ct. of carbon monoxide, 4 p.ct. of carbon dioxide, and 8 p.ct. of hydrogen. The waste gas contains an average of 19 p.ct. of carbon dioxide and 0·5 p.ct. of oxygen. Before leaving the setting, it passes through regenerators, and imparts heat to the incoming gas and secondary air. The combustion chamber temperatures are maintained as near as possible at 1300° C.

The hot coke from the retorts is carefully lowered by means of special portable inclined shoots (in which it is partially quenched) into hoppers, where the quenching operation is completed. When drained, the coke is lowered into trucks, which are drawn out of the retort-house by an endless wire rope (driven by gas-engines), and finally tipped on store heaps in the adjacent yard. A large proportion of the coke made is broken and elevated into concrete hoppers, from which vehicles may be loaded quickly and economically. The waste material from the producer furnaces is washed in a breeze-washing plant, by which it is sorted into different grades of coke and clinker.

The gas is drawn from the retort-houses by four exhausters driven by compound condensing engines of the Farey type. It is then passed through four sets of Carpenter reversible water-cooled condensers. Each set consists of twelve 24 in. diameter vertical pipes, 24 ft. long, coupled at top and bottom alternately. Each limb is tubed with 16 2-in. diameter pipes, terminating in top and bottom chambers, which are bridged to form a continuous passage-way for the water. The gas travels in the opposite direction to the water, and is cooled to within 1° Fahr. of the temperature of the incoming water. While traversing the condenser, the gas comes into contact with tar, which is sprayed into the top of each limb. With this method of working, the trouble usually experienced with stoppages due to the deposition of naphthalene is completely eliminated. The efficiency of this plant is emphasized when it is stated that no main between the washers and holders has had to be cleared of naphthalene for the past ten years.

After leaving the condensers, the gas is passed through a series of three Livesey washers, of which there are two sets. These are effective in removing the last traces of tar from the gas, and a large proportion of the ammonia present. The gas is then passed through tower scrubbers for the final elimination of the ammonia, and next enters the purifiers. There are three sets of these, each set consisting of four primary and two secondary boxes. These are approximately 40 ft. by 25 ft. by 4 ft. 4 in. deep, and have a capacity of 70 to 80 tons of hydrated oxide of iron when laid in three tiers on wooden grids. Interposed between the primary and secondary boxes is the plant for the further reduction of the sulphur compounds by the nickel catalyst process.

From the purifiers, the gas passes to the station meters, three in all, each having a capacity of 1120 therms per hour. The drums work in concrete tanks sunk in the ground. The final purification is by Holmes rotary type horizontal washers, containing anthracene oil, by means of which the small quantity of naphthalene remaining in the gas is completely eliminated. From the washers, the gas enters the holders, the total storage capacity of which at this works is 64,400 therms (560 B.Th.U. gas). The gas made at Old Kent Road is not sufficient to supply this part of the Company's district, and therefore additional gas is pumped from the East Greenwich Works, through about 4 miles of 48-in. main, by means of centrifugal fans. Other fans are employed to supplement the pressure given by the holders during the periods of maximum demand.

The chemical department has a large and well-equipped central laboratory, and here the manifold problems incidental to the manufacture of gas and the utilization of bye-products are investigated. Chemical control of the carbonizing and purification processes, necessary for efficient and economical working, is exercised at all stages of manufacture. From the information thus obtained, any adjustments which appear necessary are made to ensure the production of a gas of the required standard. The physical department and burner shop are utilized to investigate the possibilities of gaseous energy, and to ensure that the consumers of gas in the Company's area are supplied with appliances which enable them to consume gas for a variety of purposes with the maximum efficiency.

The works are fortunate in the possession of their own trained section of men fully competent in the application of first aid. Employees are granted all possible facilities to make themselves efficient in this direction. Emergency boxes are placed in the various departments, and all minor injuries are treated at the central dressing station, which is completely equipped with everything necessary. The importance of having wounds, however slight, cleansed and dressed is emphasized, and is fully realized by the employees.

There are in connection with the works a large recreation ground for cricket and football, a gymnasium in which lads are encouraged to practise physical culture, and an Institute comprising concert hall and billiards room.

The large party sat down to tea in the officers' dining room, the enjoyment of this part of the programme being enhanced by some musical items contributed in their customary excellent style by the "Metro" Band. Afterwards,

The President remarked that on the occasion of their last visit to the Old Kent Road Works, Mr. Frost was President of the Association, but he was unfortunately laid up on that occasion by illness. They were very pleased to see him now among them on his own works—for they were his own works, as he was in charge of them. Working with what were nowadays comparatively speaking low temperatures, 72 therms as a minimum was very good, and he understood that with first-class coal they got as much as 77 therms per ton. He thought that, given the plant, this was very largely a matter of supervision. The outside producers had impressed him very much, and they had also seen in the meter shops a very fine system of ventilation. Another thing which had greatly struck him was the excellent physical laboratory. Mr. Frost and the other guides deserved their heartiest thanks for a most enjoyable afternoon.

Mr. W. Bell (Reading) proposed a cordial vote of thanks to Dr. Carpenter and the Directors of the South Metropolitan Gas Company, not only for the permission to visit the works, but also for the generous hospitality extended to them; and to Mr. Frost and the other guides, for the trouble they had taken in showing the members round and explaining to them the various matters of interest. The afternoon had been a most valuable one to the members, and he personally had been

brought into contact with what he had not come across for a long time past—namely 560 B.Th.U. gas. The method adopted to keep the specific gravity constant had much interested him. In his opinion, a great deal of the success of the "Metro" burner was due to the constant specific gravity of the gas.

Mr. W. NEWTON BOOTH (Woolwich Arsenal), who seconded, referred to the high quality of gas supplied by the Company, and said that no one who knew the district and the satisfaction the gas supply gave, could question the soundness of the policy of the Directors as applied to their particular case. Working with fixed air-injector burners, it was necessary to keep the gas constant.

The vote of thanks having been accorded with acclamation,

Mr. FROST, on behalf of the President and Directors of the Company, thanked the members very much for their kind appreciation of what they had seen. He could assure them that the Association would at any time be welcome at the Old Kent Road or any other works of the Company. Mr. Grogono had referred to the last visit of the Association to these works. It was true that he (Mr. Frost) was President that year, and that on what he had looked forward to as the red-letter day of his term of office, he was unhappily laid aside by illness. In the course of the visit that afternoon, a great deal of interest had been manifested in the carbonizing practice at the works, and surprise had been expressed at the yield of therms per ton that was obtained. The advent of the thermal system had somewhat changed one's views of what ought to be the carbonizing practice in a retort-house. It was one thing to get a large volumetric yield, but quite another to secure a large thermal yield. An advantage of the new system was that it did enable them really to compare one working with another. Working on the thermal basis there were temperature limits in the combustion chambers beyond which one did not want to go; and they found that round about 1300° they could get 72 therms of 580 to 590 B.Th.U. gas; and they had seen that afternoon how the difference between this and the statutory value could be adjusted under systematic control. By increasing the temperature of the combustion chambers, one would immediately get a larger volume of gas, but the total therms might decline. One of the many advantages of the outside producers was that they allowed one to get the most out of the machinery in the retort-house. The members had noticed how expeditiously the charging of the retorts was carried out, and this was due to a great extent to the fact that the machinery was not impeded in its work. It had been a great pleasure to him and to his assistants to have the members there that afternoon.

GAS AS A PUBLIC SERVICE.

On Monday, March 3, Mr. F. W. Goodenough, of the Gas Light and Coke Company, at the invitation of the Hackney and Stoke Newington Chamber of Commerce, gave a lecture on "Gas as a Public Service." Mr. F. W. Dadd, who is President of the Chamber, occupied the Chair, and said that lately the Chamber of Commerce had heard a great deal about electricity, and felt that it was only right that the case of gas should be put before them in the same way. For this reason Mr. Goodenough had been asked to address them.

The following notes are extracted from the address.

A VIRILE INDUSTRY.

They might be interested to know, said Mr. Goodenough, that in the last twenty years, during which time they had been persistently told that electricity in Hackney was cheaper than gas, and that there was no more room for the latter, the business of the Gas Light and Coke Company had increased in the districts supplied from the Hackney and Stoke Newington offices from 15 million c.ft. in 1903 to 21 million c.ft. in 1923—an increase of nearly 50 p.ct. This was not bad for a dying industry. When he told them that their increase in output since Jan. 1 (he was speaking of the total output of the whole Company) exceeded the consumption of gas in the town of Preston for twelve months, they would agree that this was further evidence that the gas industry was in a very healthy condition. He could not understand why the people in Hackney should be so anxious to kill a local industry. In 1923 the Gas Light and Coke Company paid over £100,000 in wages and salaries to the staff employed in the offices in Stoke Newington and Hackney. This was a large sum of money to distribute among the members of the Chambers of Trade and other members of the borough. They employed at the two offices over 750 men, and they paid in rates in the two parishes last year £13,305. He suggested that this was a business of some value to the local authorities; and, in view of this, the venom with which they were attacked in the district was astonishing.

No household necessity was so well safeguarded as regards quantity, quality, price, and profit as the supply of gas to the public. As to quantity, it was a fact that the gas companies never got payment for more than about 93 p.ct. of the total quantity of gas registered by the station meters as having gone out from the works to the public. The balance-sheet of their Company proved conclusively that the consumer paid far less than he really consumed—and not more, as was often suggested. Some might regard it as a pity to destroy the legend that the meter was a robber; but these were facts, not fancies. Why was it the meter was often doubted by the consumer? Simply because he found it difficult to remember what gas had actually been used. How could he estimate the consumption of gas during any one quarter compared with a previous one? Who of them, he asked, could remember what the temperature was the last week of February, 1923, as compared with the temperature in the corresponding week of this year? He felt sure that, unless they turned up the figures, they would not have the least idea. As a matter of fact, the temperature in the last week of February, 1923, was between 7 to 14 degrees warmer than it had been this year. The result was that, whereas during the last seven days of February, 1923, they sent out 783 million c.ft. of gas, this year they sent out 963 million c.ft.—an increase of 23 p.ct. This was good business; but when the consumer got his bill, he would probably fail to take into consideration the difference in temperature this February and the February of last year. As to the quality of gas, this was certified every day by independent testing officials appointed by the London County Council or the City Corporation; and every quarter the Gas Referees, who were appointed by the Board of Trade, issued certificates as to the quality of gas supplied by the Company during the quarter. They always certified it to be above the declared calorific value on which they based their charge. The gas was tested all day and every day, and they would be fined if it fell below statutory calorific power. Finally, there was the question of price and profit. All gas companies worked on the sliding-scale in regard to dividend and price. This was undoubtedly the fairest method of adjusting prices between buyer and seller that had ever been invented; and if the system could have been applied to every industry in the country during the war, the word "profiteering" would not have got into our dictionaries.

The elements of quality entered not only into the heat value of what was supplied, continued Mr. Goodenough, but the regularity and the reliability of the supply; and they were proud to be able to say that there had been no stoppage of the supply of gas in their district within the memory of man. He did not know whether all their competitors could say exactly the same. Only a week or so ago, Woolwich had had an experience of a failure of electricity supply. He did not believe that there had ever been a complete breakdown in the supply of gas in London since it was started by the Royal Charter, which founded the Gas Light and Coke Company in 1812.

THE RELATIONSHIP BETWEEN GAS CONSUMPTION AND PUBLIC HEALTH.

What were the facts with regard to the effects of the consumption of gas on public health? A short time ago he obtained some information from the City of Glasgow—which had the largest municipally owned gas undertakings in the British Isles—which showed that, while the consumption of gas in Glasgow had gone up from 5500 million c.ft. in 1901 to 8000 million c.ft. in 1920, the death rate in that period had fallen from 21·2 per thousand to 15·3. The consumption of gas in London had gone up in similar fashion, and the death rate had fallen from 17·2 to 12·4 per thousand. He was not suggesting that the fall in the death rate could be solely ascribed to the increase in gas consumption; but the two things were related, and he was quoting the figures as a refutation of the idea that the increased consumption of gas by the public was likely to be harmful to their health. Why had the two figures any relation? Because the increased consumption of gas both in Glasgow and London had led to a very material diminution of fog, and an increase in the number of hours of sunshine in the year, with marked benefit to the health of the community. Prof. Leonard Hill had given some figures with regard to the effect of fog on the health of the City of Glasgow some time ago; these were most interesting. He showed from the death rate that a fortnight's fog in Glasgow killed over a thousand people from bronchial disease. The death rate went up during that period by a figure representing no less than 1000 deaths, as compared with the normal. It followed that the increased use of gas, which was leading to a clearer and brighter atmosphere in their cities, had a material effect upon the death rate.

GAS FOR HEATING AND COOKING.

Some said that gas-fires gave off poisonous fumes. They did nothing of the sort. This was proved conclusively by an independent Commission appointed by the "Lancet." These tests were made as far back as 1893, and no trace whatever of carbon monoxide could be detected by the blood tests. As a result, the consumption of gas per acre in London to-day was highest in the Harley Street district. Nursing homes, hospitals, clinics, crèches, were full of gas-fires, at the express advice of medical men. Gas for cooking was equally healthy. One firm of caterers alone—viz., Messrs. J. Lyons & Co.—used gas practically exclusively for cooking. Would this shrewd business house adopt an inefficient process? The Bank of England had tried a method of cooking other than by gas, but they soon discovered it was unsatisfactory. He was not a bit afraid of the competition of electricity for cooking or for any other fuel purpose. That electricity could displace gas as a fuel was an idle dream which Hackney, as well as other districts, would find out sooner or later. It was impossible to overlook the fact that a unit of electricity only contained 1·29th part of the amount of heat contained in a therm. No scientist, no engineer, could ever get another heat unit out of it.

The consumption of gas for fuel in industry was increasing by leaps and bounds; and he might say that some of their biggest consumers in that direction were firms employed in the manu-

facture of electric cables and other appliances used in the rival industry. During the war a very large estate was erected on the south side of the River Thames, with 1300 houses on it. The first 600 were wired for electricity and piped for gas, in order that the people should have a free choice. When the 1300 houses were completed, 11 people had chosen electric light, and 1289 had chosen gas. The reason for this was that the occupier knew that by using gas he was obtaining a double service rather than a single one. The fact that gas for illumination also produced warmth was often overlooked by people; and, apart from this advantage, gas light was very good for the eyes, and healthy in its ventilating power.

The long discussion which followed is an excellent indication of the value of Mr. Goodenough's address to the Hackney Chamber of Commerce.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Lighting of the Amusements Park at the British Empire Exhibition.

Sir,—We notice, on p. 546 of the "Journal" for March 5, that in mentioning the lighting of the Amusement Park of the British Empire Exhibition, you say the "Wembley" lamps being used for that purpose are of the six-burner type. This is obviously an error, as the lamps we are supplying are our special sixteen mantle lamps.

H. Staniforth & Co., Ltd.,
H. S. Staniforth,
Managing Director.

Broadway Works,
Cricklewood Broadway, N.W., March 8, 1924.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 5.]

Nos. 4706 to 5366.

British Arca Regulators, Ltd.—"Automatic control." No. 5119.
Burn, L.—"Gas cooking-stoves." No. 4737.
Cachemaille, A. S.—"Manufacture of thorium or bodies coated with thorium, &c." No. 5037.
Glover, J. A. F.—See Burn, L. No. 4737.
Green, W. L.—"Water-gas plants." No. 4982.
Hirt, A.—"Apparatus for charging furnaces with fuel." No. 4869.
James, D. W.—"High-pressure valve." No. 5304.
Lucas, F. L.—"Devices for burning gases, &c." No. 4859.
Lysaght, Ltd., J.—"Preheating air for combustion." No. 4987.
Mackenzie, M.—"Carbonizing plant, &c." No. 5272.
Morris, J. M.—"Gas-generating apparatus." No. 5306.
Outwin, E.—See Mackenzie, M. No. 5272.
Socony Burner Corporation—"Atomizers." No. 5053.
Socony Burner Corporation.—"Controlling-apparatus for burners." Nos. 5054, 5055.
Socony Burner Corporation.—"Burners." No. 5056.
Socony Burner Corporation.—"Electric control apparatus." No. 5057.
Sylvester, J.—See Mackenzie, M. No. 5272.
Westinghouse Lamp Company.—See Cachemaille, A. S. No. 5037.
White, A. E.—See Socony Burner Corporation. Nos. 5053-4-5-6-7.
Whitmore, S.—See Lysaght, Ltd., J. No. 4987.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Manchester Corporation Bill: Read a second time, and committed.

Gas Regulation Act.

The Draft Special Orders proposed to be made by the Board of Trade under section 10 of the Act, and enumerated in the last issue of the "Journal" (p. 571), were approved by the House of Lords on the 6th inst.

HOUSE OF COMMONS.

Progress of Bills.

Croydon Corporation Bill: Read a second time, and committed.

The petition of the Cardiff Gas Light and Coke Company against the Great Western Railway (Additional Powers) Bill has been withdrawn.

Gas Regulation Act.

On the motion of Mr. Albert Alexander, it was resolved in the House on the 4th inst. that the Drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Brierley Hill District Gas Light Company, Melksham Gas Light and Coke Company, and the Newquay (Cornwall) Gas Company, be approved.

In regard to the Draft of the Special Order applied for by the Marple Urban District Council, it was ordered that it be referred to a Select Committee of four members appointed by the Committee of Selection.

Illuminating Glassware.

Mr. Hogge asked the President of the Board of Trade the value of imports of illuminating glassware from Germany and Czechoslovakia for the years 1922 and 1923?

Mr. Lunn replied that the declared values of illuminating glassware imported into the United Kingdom during the years 1922 and 1923 registered as consigned from the two countries specified were:

	1922. £		1923. £
Consigned from Germany . . .	162,474	..	166,601
Consigned from Czechoslovakia .	158,934	..	175,563

The direct imports (if any) into the Irish Free State from Germany and Czechoslovakia from April 1, 1923, were not included in these totals.

Coal Deliveries (Delay on Railways).

Mr. Loverseed asked the Minister of Transport whether he was aware of the delay lately experienced by coal merchants and gas companies in the Eastern Counties in getting their trucks to and from the coalfields in the Midlands, causing inconvenience, loss in trade, and in some cases a rise in price to the consumer, and whether representations would be made to the railway companies in order to put an end to these delays?

Mr. Gosling replied that no specific complaints of delay had been made to him; but if he was furnished with particulars of any cases, inquiries would be made.

British Dyestuffs Corporation.

In answer to Mr. Graham White, Mr. Webb stated that the number of chemists in the employ of the British Dyestuffs Corporation engaged on research work was fifty-one.

LEGAL INTELLIGENCE.

ALLEGED POISONING AT BECKTON GAS-WORKS.

Coal-Tar Fumes Compensation Case.

In the Bow County Court, on Monday of last week, before Judge Hargreaves, there was an unusual claim under the Workmen's Compensation Act, in which the applicant was Gordon Stewart Sugden, a tar distiller, of Barking. He asked for an award from the Gas Light and Coke Company. In his claim, he set out that on Nov. 29, 1920, he was employed at the Beckton Gas-Works, dipping a receiver in oil, when he was suddenly overcome by the fumes of coal tar, which caused severe hæmorrhage. He claimed 35s. a week for total incapacity from Nov. 29, 1920, to April 26, 1922, and 35s. a week from Sept. 20, 1923, to date, and to continue.

Mr. Samuels appeared for the plaintiff, and Mr. Berryman for the defence.

Counsel, in opening, said that on the night in question the claimant inhaled a quantity of fumes, which made him gasp, and he was just able to call out for help when he collapsed. He was removed to the Seamen's Hospital, where he remained until April. From April, 1921, to April, 1922, he was in convalescent institutions or at home, and then he went back to the respondents as clerk, at a wage of £2 8s. a week, as against the £5 2s. he had been earning. Last September he had another attack, and on his being removed to the Seamen's Hospital it was decided to take an X-ray photograph to find the ulcer which was believed to be the cause of the internal bleeding. No ulcer could be traced, so an explorative operation was performed, and again no trace of an ulcer was found, whereupon it was decided that a wrong diagnosis had been made at first, and that his sufferings were due to gas poisoning.

The applicant supported the opening statement, and medical evidence on his behalf was given.

Dr. *Donald Cole*, the resident doctor at the works, said, for the defence, that he tested the man's heart when he was taken ill, and found no heart disease. He presented an appearance of collapse. There was no sign of gassing, and no irritation of the lungs. In April, 1922, he examined him again, and came to the conclusion that he was fit to come back to light work. His appendix had been removed, or his trouble would have been constantly recurring. He did not think the man's constitution had anything to do with coal-tar fumes poisoning. Such an irritant gas would most certainly have affected the lungs. He had failed to trace in any medical work a recent case of bleeding being set up by these gases, and he had never had a case of a man coming to him at the works from these stills. He considered the man's condition was due to a superficial ulcer.

Sir *James Cantlie* said he was visiting surgeon to the hospital. A very very irritant gas might cause bleeding, but it would kill the man by his heart or lungs. The gas thrown off from these stills "would not harm a cat."

Mr. *Wm. Gordon Adam*, Chemist at the works, said the stills had been worked continuously for 47 years—at one time there were 48 of them—and they had never had one case of gas poisoning from them. They had many cases of men who had worked there for 40 years.

Judge Hargreaves said the applicant had failed to prove that the fumes had anything whatever to do with his condition, and his judgment would have to be for the respondents, with costs.

Retford Gas Manager Complimented.—Alderman Thornton, at a meeting of the Retford Town Council last Friday, called attention to the fact that the waste-heat boiler at the gas-works was saving 400 tons of coal a year. It was the arrangement of Mr. J. R. Bradshaw (the Gas Engineer), whom he complimented.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Ordinary General Meeting of the Company was held on Tuesday of last week, at the Cannon Street Hotel, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. C. W. Braine, F.C.I.S.) read the notice convening the meeting; and the Directors' report and the statement of accounts for the year ended Dec. 31 were taken as read.

THE LATE MR. FREEMAN.

The CHAIRMAN, on rising, said: It now becomes my pleasant duty to move "that the report and accounts be received and adopted and entered on the minutes." In the first instance—it comes second in the report, but it comes first in our duty—we should recognize as a meeting, by our silence for a moment, the loss that we have all sustained by the death of our old colleague Mr. H. S. Freeman, who was for nearly thirty years our Engineer, and afterwards for twenty-five years a Director. He died in January last. Mr. Freeman was a most capable and valuable officer; and as long as he was here as a Director he was whole-heartedly concerned in the interests of the public. He acted for us in obtaining the wharf at Wandsworth, which has proved of such great benefit to the Company. He gave most earnest and close attention to our affairs, and frequently visited the works, from which, as an old engineer, he was capable of deriving much satisfaction. It was with the greatest sorrow that the Board learned of his decease. He lived to a ripe age. Mr. Freeman was modest, capable, and courteous as a colleague, and above all he was a sportsman in the very best sense of the word. He always played the game. And we are rather strong on games now, as we have a recreation ground, and our teams for football and cricket are very expert and much feared by rival clubs. I am sure you will all join in the Board's expression of regret at the loss we have sustained. [Those present did so, by rising silently in their places.]

INCREASED GAS SALES AND DECREASED PRICE.

Dealing with the accounts, you will see by the report that there has been an increase of 5·7 p.ct.—in round figures 6 p.ct.—in the sale of gas for the year, and that the number of consumers has been increased by 1253. Those consumers took among them 2724 stoves, so that you see we increased our letting of useful apparatus for the consumption of gas at a greater rate than we put on new consumers. The price of gas was reduced by three-fifths of a penny per therm—nearly 3d. per 1000 c.ft.—from Midsummer last, and by a further three-fifths of a penny, to a figure of 8·4d. per therm, dating from Christmas last. This for a short time was the very lowest price in the Metropolis, though I am not quite sure whether there is not a lower one now. But we are always competing in this praiseworthy object of making our gas cheaper and more useful to the consumers. ["Hear, hear."] The quality of the gas has been vouched by the Referees to be nearly 1 p.ct. better than our declared standard—that is to say, 474·75 B.Th.U., as against 470 B.Th.U.

THE DIVIDENDS.

As predicated in the last report, we put out for sale £250,000 of various stocks; but I regret to say that they did not reach their par value by £21,701. This I dwell upon, because I am going to justify from it our recommendation to you to add to the dividend ½ p.ct. for this half-year. We do not want to increase that dividend unduly, but we do wish to see that we avoid a loss like this, that saddles us with £21,000 of capital on which we pay dividends, but which we do not employ in our undertaking, because we do not get it. The investor wants a rather higher rate of interest nowadays, and it is in order to prevent loss due to selling capital by auction at a discount that we have increased the dividend by this amount. The next paragraph in the report states that the profit and loss account for the year, after providing for the interest on mortgages and debenture stock and on deposits and loans for the past twelve months, and the dividends for the half-year ended June 30, 1923, shows a balance of £62,111. Out of this, we recommend you to pay on the preference stock (raised in 1923) 5 p.ct., on the Wandsworth "C" stock (raised between 1900 and 1912) and the new ordinary stock (raised since 1912) £6 7s. 9d. p.ct.—that is the stock which has been sold by auction, and which carries this extra ½ p.ct.—on the Wimbledon stock (raised before 1912) £7 5s. p.ct., on the Wandsworth "B" stock (raised between 1856 and 1900) £7 12s. 6d. p.ct., on the Epsom stock (raised before 1912) £7 15s. p.ct. As to this last, it may seem to you a high rate of interest; but I must tell you, and Mr. Richards, who is present at the meeting, will confirm it, that it is very difficult to get capital for these small undertakings—and the Epsom undertaking was a small one, until it became joined to us. Then we come to a sort of "Methuselah" stock of £30,000 of Wandsworth "A" (raised before 1856—eighty years ago), and on this we recommend the payment of £9 2s. 6d. p.ct. You will thus see how, as you go back in the dates, the stock had to be raised at a higher rate of interest, because gas was not so popular as an investment in those days as it is now.

THE PORT OF WANDSWORTH.

Turning now to the accounts, the capital account shows that, after allowing for depreciation, we have increased the capital by £51,740. If you note the total of £1,177,963 which we had before, you will see that this addition is equal to 4 4 p.ct. This is a figure on which I should like you to rest your minds; for it is very necessary, if a gas undertaking—or, indeed, any undertaking—is to be prosperous, that one should not increase the capital at stake in the concern at a higher rate than the business grows. ["Hear, hear."] Now, our business has grown 5 7 p.ct. in the past year, as against the increase of 4·4 p ct. in capital; and the greater we can make this difference, the greater will be the value of your stock, and the more secure will be your dividends for the future. You will notice on the other side of the capital account that we have received £250,000; but we have lost in discount £4198 and £17,502, which together make the £21,701 mentioned in the report, to which I have already referred. Incidentally to the capital account, I may say that we have bought a very fine piece of wharf which formerly belonged to the Metropolitan Water Board next door, and we now have the river front right away to the mouth of the Wandle, and some little distance up the tidal estuary of that river, which is of considerable importance, as we unload a good deal of coal at this point. We have practically made Wandsworth into a seaport. We have established a fine fleet of steamers, and we are bringing coal there straight from Newcastle. The day is not far distant when we shall reap a considerable reward for our enterprise in providing this river frontage and these facilities, for we have become practically the coal carriers up the Thames. We do not propose to go into the coal trade; but I think companies situated on the banks of the Thames cannot fail to see the great advantage we can be to them in one shape or another through the possession of these facilities. We have added to our fleet in the last year a very fine vessel known as the "Wandle;" and in the present year we are adding another one which is to be paid for by the sale of two smaller vessels that were more expensive to run, and did not accomplish the freightage so economically. This all goes to the essential element—that it is impossible to make cheap gas without cheap coal. And you cannot get cheap coal unless you carry it from Newcastle or the Humber (the Yorkshire field) by sea. That much upon the policy, as the result of which we have this river frontage and a fleet of steamers.

PRICE REVISION AND MAINTENANCE OF WORKS AND MAINS.

Now there is another point to which you will naturally be devoting your attention. You will have noticed that one of the London Companies have already had their terms of sale of gas revised by the Board of Trade; and revision is in front of us all. We are a comparatively small Company compared with other Companies who supply this great city; but there is a small part of our area which, unfortunately for us, comes within the purview of the London County Council. It is only a small part, but it is sufficient for the purpose of allowing the London County Council to have a say in the price we charge for our gas. I do not think they can say much. If we are to consider this question at all, I am obliged to point out that, although we may be the lowest in the matter of price of the Metropolitan Companies, we are about the largest in the matter of upkeep of our works and mains, and I will tell you why. The war lasting four-and-a-half years, and the peace (which is rather worse than the war) over the five-and-a-half years which have since elapsed, prevented us following the ordinary course of gradually replacing not only worn-out plant, but "grown-out" plant, if I may coin the expression. When you are doing an increasing business, it is necessary that you should replace with something larger the plant which was sufficient for your earlier days. Therefore there were certain works to replace, which we could not do in war-time, when there were neither men nor materials available; and we have not been able to do the work since, because even now prices are easily 100 p.ct. more than before the war. If we go adding a lot of plant which will be out of balance with the prices at which the existing property was obtained, you will see at once that we shall be loading the scale at the wrong end. Therefore the necessity is before us of making good these things. Thus for last year—and I expect the same will be the case for the coming year—heavy charges have to be reckoned with for materials and labour required for repairs and maintenance of works. And yet we sell the cheapest gas. What I have said applies also to mains. Coupled with this new legislation about therms—for which I have not a great deal of respect, because I am an old-fashioned man, and have lived on cubic feet all my life—there are fresh provisions with regard to pressure. Whereas formerly we had only to supply gas at ½ in. pressure, the new Act obliges us to make that four times as great, at the end of the consumers' service, which is a point that he has more under control than we have. We have had to spend, and are likely to continue to have to spend, a great deal of money, to carry the gas at this higher pressure to the limits of our area. We have a large district—Mitcham added to Wandsworth, and Epsom added to both, make altogether 44 square miles. It is very much larger than the original London district of the Gas Light and Coke Company, who supply about twelve times as much gas as we do. To get gas all over such an area is not an altogether simple problem. Those who talk about revising us, should look into the facts a little. They will then find that there will not be much for them to do, if they wish to do justice to us.

PREPAYMENT CONSUMERS AND THEIR FITTINGS.

With regard to stoves and fittings, you will remember that many years ago we thought of a plan to increase the number of our consumers, and we did. It was a pet scheme of the late Sir George Livesey; and I, as an old friend of his, was the second man to take it up and work it, in connection with another company. The idea was to supply working men's houses, not only with gas, but with the means of burning it. In those days four or four-and-a-half sovereigns supplied a working-man's house with a stove, a couple of lights, and a meter. That idea "took" amazingly, and to-day for this description of service we have something like 47,000 sets of fittings, where a penny or a shilling is placed in the slot. It was very popular with poor people before the war; but during the war, when the servant question became impossible, people of a superior class found that gas-stoves were labour-saving, and the result was that we were literally besieged by requests from them for the same accommodation. So long as this new class of consumer was content with a £4 10s. equipment, and we could buy it, this was all right; but during the war, the same thing cost £6 or £7, and the superior quality consumer was not satisfied with what we gave the working man. He wanted a bigger stove and prettier fittings. I am dwelling upon this, because there has been some misunderstanding on the matter. To-day these people require an expenditure of £11 as a minimum, and sometimes £12 or £13 per house; and it is a question how far we are justified in going on providing these fittings for a class of consumer who formerly always provided them for themselves. There is an enormous amount of capital involved in house fittings which are in the hands of people who do not own the gas-works at all. The average house, rented at £50 a year, will probably require fittings costing £25 or £26. As I said, they were provided before the war

by the consumer himself; but the occupiers of the small houses which are built nowadays, but are not tenanted by working men, still want to enjoy the privilege of having this capital found for them, and to pay for the fixtures by the "*plus*" charge on the gas involved, by putting a penny or a shilling in the prepayment meter. The finding of this capital is a serious matter, and the growth in the number of shilling-in-the-slot meters shows at once the larger consumption and the higher quality of the consumer. Some years ago we found that we were paying double the price for the fittings and labour, and that the money generally did not go so far as it had done. Therefore we sought relief from this, and had legislation passed to enable us to raise the rent—which was formerly 10d. per 1000 c.ft.—by 50 p.ct. This was modest enough; for at the time we were paying double for the things. This accounts for the extremely satisfactory income arising from our very large expenditure on stoves, fittings, &c., and the services attached to them; but this form of service demands four times the cost for inspection and for collecting the money that the old system required. It is not merely the cost of the things themselves that has to be considered, but the cost of the services attached to them; and if you compare this balance-sheet with that for 1912, you will find there is an enormous disparity in this service department. A good many people complained of our making this extra charge, and others threw stones at us, willing to wound and fearing to strike; but it is amply justified, and no reasonable man can dispute it. ["Hear, hear."]

THE LABOUR SITUATION.

I think that is the length of my story. You are getting a satisfactory dividend. A small addition is made, to enable the stock, when it comes to be sold, to fetch par value, as we do not like seeing any discount. The time has come when, owing to strikes in coal mines and otherwise, coke has been discovered to be a good fuel, and has commanded a good price. If it had not been for the fact that coke had re-established its position as a combustible, such good figures could not have been presented to you. This state of affairs may, of course, change, and coal may become cheaper again; but in this connection I would point out that we are threatened with another coal strike, and I have been asked how we are preparing for it. Well, we cannot provide against it. The means of bringing gas coal to London on the scale which we require cannot easily be doubled, or even increased by 50 p.ct. In fact, when these foolhardy and unwise strikes come about, I am rather in favour of allowing the suffering to fall upon the person who really employs both sides, both coalowners and coalminers, and also the gas companies, and the gas companies' employees—and that is the consumer. I am rather in favour of allowing him to suffer for these wretched quarrels. These strikes are plunged into with indifference to the comfort and the safety of the population, and a recklessness which is perfectly incredible. How long Parliament, whether it is a Labour Government or any other, will allow these quarrels between employers and employed, I cannot say; but, speaking as a consumer of gas, I want to know where I come in. ["Hear, hear."] If they adopted the French method, where the mayor of a commune can compel the parties to a strike to submit to arbitration, the situation would be much improved. We have indulged this habit of striking too far, and the sooner something is done to put an end to it the better. It should not be one-sided legislation; I am no class advocate. But I do say that the real employer of the railways, the ships, the docks, the gas-works, and other things, should make himself heard. It is the consumer who suffers—and we are all consumers—and when he has suffered enough, I hope he will use his power in Parliament to bring the whole system to an end, because it is a very vicious and bad system. I beg to move the adoption of the report and accounts.

Dr. T. A. IVES HOWELL formally seconded the motion.

SOME QUESTIONS.

Mr. BURGESS said he was very pleased to hear the address of the Chairman. There were, however, one or two points on which he would like some further information. Certain Directors were to be re-appointed; and he was wondering if from time to time it would not be wise to have an outside man on the Board, so as to introduce fresh blood. Then with regard to the outgoing Auditor, Mr. Burton. The accounts ran into some hundreds of thousands of pounds, and he would like to know whether they had a proper Chartered Accountant to audit them. As to the reserve fund, was this invested in gilt-edged stock?

The SECRETARY: £7000 is invested in War Stock.

Mr. BURGESS said the very essence of a reserve fund was that it should not be placed in the working of the undertaking.

The CHAIRMAN: I do not agree with you there.

Mr. BURGESS replied that he believed it was the usual procedure. Then there was a special purposes fund. What were these special purposes? Loan capital, he took it, was redeemed from time to time.

The CHAIRMAN said that not all of the loan capital was redeemed; most of the debenture stock was irredeemable. Before Mr. Freeman died, the Board consisted of ten members. It was, however, provided in the Act of Parliament that the number of Directors (which was unduly increased when they took over the Mitcham undertaking) should be decreased as vacancies arose through death or from other causes. These vacancies were not to be filled up, because it was very properly held that if a Board of five or six people could not direct an undertaking of this sort, they were not worth much as Directors. As a rule on Boards there were one or two men who identified themselves very closely with the work. The second question related to the Auditor. If the proprietor would make inquiries outside that room, he would find that there was no one in England who practised more as a gas accountant, or whose opinions carried more weight, than Mr. Burton, who was a fully qualified accountant, and was the secretary of several gas companies and the chairman of some others. It was a great acquisition when they secured his services for their own Company. As to the special purposes fund, they were allowed to set aside a sum not exceeding 1 p.ct. of the capital to form a fund, so that when "outgrown" plant had to be dispensed with there would be money to replace it without taxing the price of gas. Then with regard to the reserve fund. For a year or two during the war they were paying their bankers for loans (and they could not raise money in any other way) 7 p.ct., while the reserve fund investments were bringing in 3½ p.ct. He was Chairman of four or five other gas companies, and they all did the same as the Wandsworth Company. He was obliged to the proprietor for giving him the opportunity of explaining these things.

The resolution was then carried unanimously.

THE DIVIDENDS.

On the proposition of the CHAIRMAN, seconded by Dr. IVES HOWELL, the dividends outlined in Mr. Jones's speech on the report and accounts were agreed to.

RE-ELECTIONS.

Dr. IVES HOWELL said they had once more to re-elect as a Director of the Company their very old friend, and most able Chairman, Mr. Harry Jones. He could not tell them what Mr. Jones was to the Company, and he was sure he could not tell them exactly what the Company was to Mr. Jones—that it was always in his thoughts, he knew. Mr. Jones was absolutely indispensable to the Company so long as he was able to remain—and he had plenty of "go" in him yet. He had pleasure in proposing his re-election.

Mr. R. M. CHART seconded the proposition, which was cordially passed.

The CHAIRMAN (who was received with applause) said Dr. Howell was the grandson of the man who founded the Wandsworth Company, and was Deputy-Chairman of their Works Committee. He also looked after the Profit-Sharing Committee. He lived close to the gas-works, and like his father and grandfather before him took the greatest possible interest in the Company's welfare. The stock his family held in the concern was very considerable indeed. He asked them to vote for his re-election.

Mr. G. F. PAGE seconded this, and it was unanimously agreed to.

The CHAIRMAN next proposed the re-election as a Director of Mr. Page, and incidentally mentioned that the former Chairman of the Mitcham Company, and their own Deputy-Chairman, Mr. R. Garraway Rice, was unfortunately unable to be present at the meeting, owing to illness.

Mr. CHART seconded this, and it was also carried.

Proposed by Mr. POTTER, Mr. E. L. Burton was re-appointed an Auditor of the Company.

VOTES OF THANKS.

The CHAIRMAN said he was very pleased indeed to see such a large attendance at the meeting. Their thanks were due very largely, for the returns that had been put before them that day, to the very efficient staff. Their old Secretary, Mr. Braine, was a kind of rock, and they would find it very difficult to shake him from the accuracy of his figures or the application of his upright principles. In their young engineer, Mr. Croft, they had a most energetic and keen co-operator. He was always seeking out something fresh to do. Thus the Company had a very promising engineer, as well as a very faithful and devoted Secretary. Mr. Croft would make his mark; and he was sure that from both officers and men they would have as good service in the future as they had had in the past.

Mr. E. L. BURTON said he would like to second this, as he saw the results of the excellent work done, and could therefore with some practical knowledge support what the Chairman had said with reference to the services rendered to the Company.

The vote was heartily passed.

Mr. BRAINE, in acknowledging the vote, remarked that something had been said by the Chairman about the late Mr. Freeman, and, as one of the oldest members of the staff, he would like to say, on behalf of himself, having worked with him as a colleague, and on behalf of the men who followed him to the grave, how much his death was regretted.

Mr. C. M. CROFT, who also returned thanks, said he would have great pleasure in taking the message to the staff and workpeople, who had unstintedly served the Company in the most loyal manner. As to himself, the kindness shown by the Chairman in his remarks was only another example of what he had received at his hands ever since he was a pupil.

The proceedings closed with a hearty vote of thanks to the Chairman and Directors, on the proposition of Mr. POTTER, seconded by Mr. W. RICHARDS.

REDHILL GAS COMPANY.

The ordinary meeting of the Company was held at the Market Hall, Redhill, on Feb. 26—Mr. W. Lees Stenning, M.B.E., J.P., presiding. The Chairman, in moving the adoption of the report and accounts, drew attention to the remarkable increase in the sales of gas—no less than 11¼ million c.ft. The business of the Company, he said, continued to show satisfactory expansion; and to cope with the increasing demand for gas, considerable extensions had been put in hand during the year. Dividends were recommended at the rate of 6 p.ct. per annum on the cumulative preference stock, and 5½ p.ct. on the ordinary "B" stock (less income-tax) for the second half-year of 1923. Mr. W. H. Bennett (Managing Director), in seconding, said that the price of gas was only 33 p.ct. above the pre-war charge. Their experience in 1923 had been remarkable. During the year, the number of gas-appliances—cookers, fires, radiators, geysers, circulators, and so on—sold and fixed by them exceeded that of 1922 by 25 p.ct. In addition, there were many others supplied by local builders and ironmongers, of which they had no record. Replying to a vote of thanks moved by Mr. W. M. Mason, Mr. Ernest Seears (Engineer) said that the ultimate aim of all gas companies was to give satisfaction to every consumer.

Reduction in Price at Cradley Heath.—The Cradley Heath Gas Company announce a reduction in the price of gas for lighting and domestic purposes equal to 4⅜d. per 1000 c.ft., and for power and manufacturing uses equal to 6d. per 1000 c.ft. A reduction to the slot-meter consumers will be effected by increasing the quantity of gas supplied to 18 c.ft. per penny.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following further notices regarding applications to the Board of Trade under the Gas Regulation Act.

Manchester Corporation.

By section 40 of the Manchester Corporation (General Powers) Act, 1921, it is enacted—

(1) The price to be charged by the Corporation for gas supplied by them to persons who shall burn the same by meter shall not at any time exceed 5s. per 1000 c.ft.

(2) Provided that within one year from the passing of this Act the Corporation shall apply to the Board of Trade for an Order under section 1 (power to substitute new basis of charge) of the Gas Regulation Act, 1920, the Board of Trade may by such Order authorize the Corporation to charge a maximum price per therm corresponding as nearly as may be to the maximum price authorized by this section without any addition in respect of increases in the costs of the production and supply of gas which have occurred since June 30, 1914.

Notice is given that the Manchester Corporation applied within the time prescribed by the Act to the Board of Trade for such an Order.

AMENDING ORDER.

Eastbourne Gas Company.

The Board of Trade give notice that the Eastbourne Corporation have made application for an Amending Order revising the powers of charging authorized by the Eastbourne Gas (Charges) Order, 1921, by reducing the standard price prescribed by that Order.

Any persons affected desiring to make representations with regard to the application may do so by letter, addressed to the Director of Gas Administration, Board of Trade, Great George Street, S.W. 1, not later than March 13. A copy of such representations must at the same time be sent to the Town Clerk, Eastbourne, and to the Secretary, Eastbourne Gas Company.

SPECIAL ORDER.

Reading Gas Company.

It is the intention of the Company to apply for a Special Order under section 10 to authorize the purchase by them of the undertaking of the Pangbourne Gas Light and Coke Company, Ltd., and to authorize the raising of additional capital.

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Kirkby-in-Ashfield Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm.

Prepayment meter clauses are included. (March 5.)

Market Drayton Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15·4d. per therm. (March 1.)

AMENDING ORDER.

Brighton and Hove General Gas Company.

[On the application of the Company.]

As from the date of this Order, section 3 of the Brighton and Hove Gas (Charges) Order, 1921, shall be read and have effect as if the word "twelve" were substituted for the words "fifteen-and-one-fifth" therein. (March 5.)

SUNDERLAND GAS COMPANY.

At the Annual Meeting of the Company held on Feb. 28, the Chairman explained the Company's intention to create stock to the extent of £50,000, and to borrow an amount not exceeding £50,000. They were not proceeding to raise the capital, but the Directors wanted power to issue the stock as they deemed necessary.

The year's accounts were considered exceedingly satisfactory. The trading profit amounted to £14,586, and interest of £2349 brought the total to £16,935, which was practically the amount required to pay their maximum dividend of 6 p.ct. In addition to this they had carried forward £12,655, and had a reserve fund of £17,310. Coal and oil had cost a good deal more, but salaries, wages, repairs, and maintenance had decreased by £14,973 to £237,033. The revenue from the sale of gas, though an increased quantity had been used, showed a decrease, which represented a saving to consumers of £55,682. At Ayre's Quay Works the Company had built a new spiral gasholder of a capacity of 1 million c.ft. This gave them a stock of 25 p.ct. more gas than they had had before. Though they had had to pay more for coal, oil, &c., they had been able to supply gas as low as 2s. 3d. per 1000 c.ft. even to their smallest consumers, and they could claim to be one of the cheapest suppliers of gas in the country. They obtained £147,736 from lighting, and £97,553 from residuals. The report and accounts were adopted, and a final dividend of 3 p.ct. on the ordinary stock, less income-tax, was declared. A resolution was passed authorizing the Directors to create and issue further ordinary stock of a nominal value not exceeding £50,000, and to exercise borrowing powers up to £50,000 at such times as the Board shall determine, and, in the event of any money borrowed by the Company on mortgage bond being repaid, to re-borrow such sums.

NORTH MIDDLESEX GAS COMPANY.

Largely Increased Business.

The Ordinary General Meeting of the Company was held on Monday of last week, at No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. E. L. Burton) read the notice convening the meeting, and the report and accounts for the year ended Dec. 31 were taken as read.

The CHAIRMAN, in moving their adoption, said it would be seen that they had succeeded in meeting from the profit the demands made upon them in the matter of dividend, and had made a certain apportionment to the reserve fund. Nevertheless, there remained certain figures of a wholly exceptional character, which were due to the very peculiar conditions under which the Company had had to work in order to attain the results recorded by the report. They had been called upon to face an extraordinary demand for gas. The 6 p.ct. increase in sales, over those of 1922, which was set forth in the report, had practically come in the closing months of the past year; and this increase had continued to obtain at an enhanced rate during the current year. In fact the Company were now called upon to meet increases which, unless those responsible for the administration of the undertaking had anticipated them with some degree of accuracy, and had spent money in an almost prodigal manner to prepare for them, their resources would have been quite unequal to meeting to-day. Within the last 21 months the price of gas had been decreased 3½d. per therm, which represented a saving to the consumers of something like £35,000 a year. No doubt this reduction in price had been a factor in stimulating and promoting the increased use of gas with which the Company now had to deal. The development of new building estates also created fresh and sudden demands. The capital account showed them that the total capital issued amounted to £257,148, which brought out their expenditure per million cubic feet of gas sold at £527, a reduction of something like £30 during the year, notwithstanding the fact that all through the year they had been reconstructing the works and re-organizing the distribution system. New mains had cost during the year £10,697; while on the repair, maintenance, and renewal of mains and service pipes there had been expended £10,456—a total expenditure upon this branch of the undertaking of £21,000 within a period of twelve months. That they should be able to meet charges of this kind, and then on top of that succeed in showing a normal profit, was to his mind wholly remarkable. In connection with the manufacture of gas the accounts exhibited excellence. Carbonizing wages were less than 3d. per 1090 c.ft., which was very much like what the figure was before the war. In the aggregate the sum allocated for repair, maintenance, and renewal of works and plant, mains and service pipes, meters, and stoves and fittings amounted to 22d. per 1000 c.ft. It was certainly extraordinary that they had been able to spend money to this extent, and yet show the margin of profit they did. But the money spent had been well spent, and in the right direction. It could be seen from the profit and loss account that whereas they brought in £4599, they were taking forward £4954. This was an increase of £355 in the carry-forward. The time was rather an anxious one, because they had to deal with developments which had come upon them rather suddenly; but though they had experienced this greatly increased demand, he did not think there had been any deficiency or difficulty whatever in the supply of gas. The Company had been for some time wedded to co-partnership, with gratifying results. Co-partnership was a very important movement, and they would all like to see it spread to other industries.

Mr. H. A. LERMITTE seconded the motion, which was carried unanimously.

Thereafter, on the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were declared, less income-tax, at the rates of 11 p.ct. per annum on the original ordinary shares and £7 14s. p.ct. on the additional ordinary shares, and it was agreed that the sum of £1192 be carried to the reserve fund.

Mr. H. F. Lofts and Mr. A. F. Phillips were re-elected Directors of the Company, and the Auditor (Mr. L. Hardy) was also re-appointed.

The CHAIRMAN moved that the Directors' fees be increased by £350 per annum. He said this matter had last been dealt with by the proprietors on the conclusion of the war, which was five years ago. Since then the business had increased 50 p.ct.; and the finances and technical and physical features were in an infinitely more satisfactory position now than they were then. All this had not been attained without effort on the part of the Directors.

The proposition was seconded by Mr. A. W. OKE (who declared that the increase was well deserved), and agreed to unanimously.

A hearty vote of thanks to the officers, staff, and workpeople was cordially passed, on the motion of the CHAIRMAN, seconded by Mr. BEAUMONT. The vote was acknowledged by Mr. BURTON (the Secretary) and Mr. LAWRIE TREWBY (the Engineer and Manager), who said that the co-partners were working better than ever.

Subsequently a Special Meeting was held, at which the following resolution was passed, on the proposition of the CHAIRMAN, seconded by Mr. LERMITTE: "That as from Jan. 1, 1925, the original ordinary shares of the Company be converted into original ordinary stock, and the additional ordinary shares into additional ordinary stock, and that the Directors be and are hereby authorized to take the requisite steps to give due effect to this resolution."

Profit and Output at Lancaster.—The Lancaster Corporation Gas Department reported a profit on the year's working of £11,262, and handed over £4000 to the relief of the rates; the remainder being placed to reserve. It has also been agreed to reduce the price of gas from 3s. 2d. to 2s. 11d. per 1000 c.ft. The salary of Mr. G. Dixon, Engineer, is increased from £550 to £650. While Mr. Dixon has been Manager the output has increased from 154 million c.ft. to 320 millions, and the income from £26,000 to £79,000. The income from the sale of gas last year was £41,724.

READING GAS COMPANY.

The Annual Meeting of the Company was held on Feb. 26—Mr. G. W. WEBB, J.P., presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the results of the year under review were highly satisfactory. Further improvements had been made in the Company's plant and distributing mains, and a considerable amount of renewal work had been carried out, including the replacement of small mains by larger ones. To meet the capital expenditure, £10,000 of the capital authorized by a special meeting held last year had been issued in June last as ordinary stock, and had realized very satisfactory prices. The increase in the sale of gas was the largest in the Company's history. The price had been reduced three times since the commencement of 1923, making, with the previous reductions, a decrease of nearly 1s. 1d. per 1000 c.ft. since January, 1922. Naturally, this large reduction—approximately 25 p.ct.—had reduced the income; but this would be counterbalanced by a general reduction in expenditure. Interim dividends had been paid on Sept. 1, 1923, and the Directors now recommended the payment of dividends at similar rates in respect of the past half-year, less income-tax. He thanked all their employees for their work during the year. It was now nearly 21 years since their Engineer, Mr. D. H. Helps, started with the Company; and it was largely due to his forethought and energy, and that of their Secretary, Mr. A. B. Stedman, that so much progress had been made.

The DEPUTY-CHAIRMAN (Mr. T. E. Hewett), in seconding, after mentioning the increasing popularity of gas, referred to the amicable relations which had always existed between the Directors and the Company's employees. Under the present management he was sure this good feeling would continue, for their Engineer took a keen and personal interest in the welfare of those under him.

The motion was carried unanimously.

An Extraordinary General Meeting was afterwards held, at which the proprietors confirmed and approved the agreement with the Pangbourne Gas Light and Coke Company, Ltd., for the purchase of that undertaking; and the Directors were authorized and empowered to make application to the Board of Trade for an Order to acquire the Pangbourne undertaking and to extend the Company's area of supply.

WELLINGTON GAS COMPANY.

The Annual Meeting of the Company was held on Tuesday last—Mr. C. W. LEAKE (Chairman) presiding.

The annual report of the Directors and statement of accounts were submitted, in which it was reported that for the year ended Dec. 31, 1923, there was a profit of £6498. The Directors recommended a final dividend at the authorized rate of 6½ p.ct. per annum on the ordinary stock, making 6¾ p.ct. for the year, less tax. In the Oakengates and St. Georges area the sale of gas had increased by 15¾ p.ct. over 1922.

In a résumé of the year's working, the CHAIRMAN alluded to the amalgamation of the Wellington and Oakengates Companies, and remarked that the amalgamation, so far as the first year's working was concerned, had been a success, and the Board had been able to reduce the price of gas by 4d. per 1000 c.ft. as from last Christmas. Turning to the accounts, Mr. Leake remarked that capital had been expended during the year to the amount of £1574. There was still unexpended on capital raised the sum of £5830. Dealing with the principal item of expenditure—viz., coal—the advantages of modern plant were at once seen in the accounts. Though production at Oakengates did not cease until early in April, the Board had been able to make considerable savings in coal; the total quantity used being 331 tons less than in 1922, notwithstanding an increase in the total make of gas of over 6 million c.ft.—equivalent to a further 300 tons. Several of the items under distribution charges showed a considerable increase over 1922, particularly repair and renewal of mains, services, and meters. Referring to the receipts, the Chairman said that the sum of £23,515 was received from gas sales. In the Wellington area an increased sale of 2 million c.ft. was recorded, and in Oakengates 2¾ millions. The year 1923 was very good from the point of view of the residual market. Coke had commanded a good price, and tar had realized the high figure of £2013. Notwithstanding an appropriation of £500 from net revenue for the special purposes fund, the net revenue balance was £3760, as compared with £2150 for 1922, when £4317 was transferred from this account to meet the cost of linking up Oakengates with Wellington. The total output now exceeded 111 million c.ft. The Company had 31¾ miles of mains laid, and were supplying 3070 consumers, with plenty of scope for additional business. The Chairman then formally moved the adoption of the report and statement of accounts.

Mr. H. HOBSON, seconding, said the outstanding feature during the last year had been the successful linking-up of the Wellington and Oakengates Works. The step taken had not only strengthened the Company, but had been the means of giving Oakengates a better and cheaper supply.

Mr. F. E. MARCHANT, in commenting on the statement of accounts, congratulated the Company on the efficient manner in which the undertaking was carried out.

The report and statement of accounts were unanimously adopted.

Lighting of Westminster Bridge.—Mr. Charles Matthews (Chairman of the Highways Committee) informed Mr. J. D. Gilbert, M.P., at the London County Council meeting on Tuesday of last week, that new lamps were recently put on the pavement of Westminster Bridge, for experimental purposes. Until the result of the experiments was known, no decision could be come to with regard to any alteration or improvement of the lighting. He could not at the moment state the cost of the new system.

GOSPORT GAS ORDER.

The inquiry by Mr. H. C. HONEY (Director of Gas Administration at the Board of Trade) into the Order promoted by the Gosport Gas and Coke Company for the acquisition of the Fareham Gas and Coke Company, was concluded on Monday, March 3 [the previous proceedings were reported in the "JOURNAL" for Feb. 27, p. 503, and March 5, p. 579.]

Mr. *W. R. Herring* (Consulting Engineer), who is advising the Gosport Town Council with regard to the proposed amalgamation, gave evidence, and said that under the arrangements contained in the Draft Order the Fareham shareholders would get a standard dividend in the future, irrespective of the price of gas. It would be a better security, and more marketable. Comparatively speaking, he said, the preference stock of a gas company to-day was very nearly a gilt-edged stock. He then discussed the pre-war position of the Fareham Company, to show that between 1911 and 1914, when the price of gas had remained the same, there had been a steady decrease in profit, though there had been an increase in the amount of gas sold. Also, the annual carry-forward had been reduced. As to the present value of the Fareham undertaking, the basis of value must be the maintainable profit, and they could not deal with the value of gas undertakings to-day other than on a pre-war basis. The stock to be allocated to the shareholders of the Fareham undertaking represented a sufficient price for the undertaking, apart from the large sums which had been added for extraneous purposes—namely, the £2250 to be paid to the Directors, £4500 to the Manager, £39 to the Auditors, and the mysterious sum of £3200, representing surplus assets, making a total of about £10,000. He regarded as grossly extravagant the 10 years' fees it was proposed to give the Directors because, at the most, they were elected for three years, and, if not re-elected, they fell out. Although he knew that open-handed consideration had been given to the Directors of other companies, he could not see the logic of it. As to the Manager's compensation, he confessed he was in a difficulty. It was a serious thing for a man of forty years of age or so to lose an appointment of this character; but here again the promoters of the Order had no right to be generous with other people's money—the Manager's and the Directors' compensation was a matter for the shareholders of the Fareham Company. The Gosport Company should take over the Manager, and give him a post secured for ten years at his present salary, instead of capitalizing the value of his salary and making other provisions for carrying on his work. There must be someone with a special knowledge of the Fareham area to look after the interests of the consumers there. Apart from the manufacture of gas, there would be all the administration of a gas company in that area. If he were kept on, he would be able to earn at least half his salary, instead of the whole being a dead loss. As to the differential price, witness handed in details of the additional cost of supply to Fareham, as against Gosport. The interest on the preference capital to be issued to the Fareham shareholders would be £1217 per annum, representing 2·16d. per therm. He had calculated this on the basis of 30 million c.ft., as being the Fareham consumption. The interest on the loan capital to be exchanged would be £201, representing 0·36d. per therm. Capitalizing the amounts to be paid to the Manager, Directors, and Auditors at 6 p.ct., the interest amounted to £407, or 0·72d. per therm. The capital value of the surplus assets (£3200) at 6 p.ct. was £192, or 0·34d. per therm. The cost of the high-pressure main and compressing plant was £4000, and taking that at 6 p.ct., and allowing 5 p.ct. for depreciation, the figure was £440, or 0·79d. per therm. Extra services in Fareham, *plus* boosting costs, amounted to £636, or 1·13d. per therm. The total of those charges was £3093, representing 5·5d. per therm. He had deducted the Manager's salary, however, which would be saved by the Gosport Company, and had also given credit for the fact that the Gosport capital, in so far as it was represented by manufacturing capacity, was not now fully used, but would be more fully used if the Order were granted. These two items amounted to £873 or 1·55d. per therm, and his final figure was, therefore, £2220, or 3·95d. per therm, which represented the extra cost of supply in Fareham. Witness then handed in a table showing his estimate of the annual sales of gas in Fareham for the next 31 years, basing his figures on an annual increase of 3 p.ct. (compound), the revenue raised per penny of charge, and the differential required to raise revenue sufficient to pay the capital and running charges of £2220 per annum in excess of normal distribution costs. This showed that in the first year the differential required would be 3·95d., in 10 years 3·02d., in 20 years 2·25d., and in 31 years 1·6d. Fareham, he said, was not expanding at such a rate that it would be safe to anticipate an increase of more than 3 p.ct. (compound), and even in that figure he had not taken account of the competition from electricity that would have to be faced. As to the charge for prepayment meters, witness referred to the inquiries that had taken place, and the ultimate acceptance of the present figure by the Gosport Company. The rate charged per therm was not the only factor for consideration; the main factor was the amount of gas consumed, and the amount of additional revenue raised by a prepayment installation. As to the transfer of the unexhausted capital powers of the Fareham Company to the Gosport Company, he could not see that the latter would require them for a very long time to come, and it was contrary to the practice of Parliament to give a Company extended capital powers without it being shown clearly on what the money was to be spent.

Cross examined by Mr. ABADY on this point, witness said that a gas company's affairs should be reviewed at reasonably frequent intervals on behalf of the consumers.

To Mr. ABADY's remark that the Gosport Company were simply asking for the capital powers of the Fareham Company to be continued, Mr. Herring said that Parliament did not authorize that, in the event of the transfer of the Fareham Company, the unexhausted capital powers should also be transferred. If the Company ceased to exist, then their powers ceased.

Mr. ABADY replied that they would be spread over a larger area; witness could not have it both ways.

With regard to the conversion of capital, Mr. ABADY said that the Fareham ordinary capital was substantially the original capital autho-

rized in 1865, at 8 p.ct., and that there had been no conversion to stock of a lower denomination. What was taking place in this case was the conversion of the Fareham stock to a lower denomination—namely, 5 p.ct. preference.

Witness agreed that it was usual for the original stock of a gas company to be 10 p.ct. stock, and that in many cases that stock had been consolidated into one of lower denomination, subject to possible increase and decrease under sliding-scale; but the Fareham shareholders in this case were being treated very much better than ordinary shareholders were treated under a consolidation of the kind mentioned.

In the course of further cross-examination, Mr. ABADY said there was no great object in discussing witness's views as to the proper price to be paid for the Fareham undertaking, and suggested that the Gosport Corporation did not care what the Gosport Company were paying, subject to the differential-taking care of the difference in cost of supply. Witness replied that he had to justify a differential price which would relieve Gosport of financial risk, and in arriving at that he must arrive at values.

In an examination of his figures, Mr. *Herring* said he had assumed that the Fareham Company, pre-war, were earning standard profits, which would amount to £1393 per annum (though actually they were not), and he had allowed 16⅔ years' purchase, arriving at a figure of £23,216. When Mr. Abady pointed out that the profits in 1921 and 1922 would have enabled the Company to distribute a dividend considerably in excess of the standard, had they been so minded, witness said that it was being assumed that those profits were earned on to-day's standard price. Asked whether, supposing the profits to-day enabled a dividend larger than the standard to be distributed, this would affect either the £1393 or the number of years' purchase, witness said it would not influence the latter, because that was arrived at on the value of money to-day—*i.e.*, 6 p.ct. He would not agree that 18 years would be a fair figure. Further discussion took place with regard to the ordinary stock being replaced by preference, at the end of which Mr. Abady suggested that the discussion was more or less theoretical, because what was taking place was not a compulsory transfer, but a bargain between a willing buyer and a willing seller.

Considerable attention was then paid to Mr. Herring's method of arriving at the differential in Fareham, it being suggested by Mr. Abady that excessive capital charges were being allocated to Fareham; but witness did not agree. As to the cost of extra services that would be required in Fareham, he said he had made allowance for increases in the salaries of those who would take over the manager's duties in a sub-divided form, in view of their extra responsibilities. In reply to Mr. Honey, witness said that if by any process it was possible to review the differential from time to time, and it was found that the revenue from it was greater than was anticipated, he thought he could say on behalf of the Corporation that they would be willing that it should be adjusted.

Mr. ABADY said that the Gosport Company had no objection to the differential and the standard price being subject to review by the Board of Trade, but he did not know whether the Fareham Council would object.

Mr. HONEY suggested that it might be possible for some agreement to be reached during the luncheon interval.

On the resumption of proceedings, Mr. WROTTESLEY said that no agreement had been come to. On behalf of the Gosport Corporation, however, he offered to agree to the 3d. per therm differential remaining in the Order as lodged—though he did not agree that it was sufficient—and to regard it as a base, to be whittled down year by year if the increased consumption in Fareham justified it.

Mr. ABADY said the Gosport Company were prepared to accept the provisions in the Order, as drafted, subject to power of revision by the Board of Trade if, on the application of the Gosport Corporation, it could be shown that the differential was not sufficient, after five years, to provide for the increased cost to Fareham. He could not assent even to that, however, unless the Fareham Council also assented.

Mr. WROTTESLEY, addressing Mr. Honey, said that the Gosport Corporation took a very strong view of the propriety of the bargain come to between the two companies, and the way in which the transaction had been conducted. Here was a bargain which would obviously confer a benefit upon the Fareham consumers and shareholders, which might, and probably would, help the Gosport Company, and would tend to help the Gosport consumer. Surely, if benefits were to be distributed they should be distributed equally. If anybody were asked to bear the risk, and if they were not offered an indemnity, they should be given some *quid pro quo* for suffering that risk. As to the bargain come to, he said that, in addition to the Fareham shareholders receiving an assured dividend equal to their standard dividend, the transaction had been loaded with a present of cash to the shareholders, the Directors, the Manager, and the Auditors. It appeared to be thought that there was some magical fund from which this money was to be produced. There was no such fund. Seven years' or ten years' compensation to Directors might or might not be sanctified by usage, but he submitted it was wrong to give them an amount which would more than cover the fees they would receive in their present term of office. Again, to pay the Manager ten years' salary at once, for doing nothing, instead of continuing to employ him, was throwing money into the gutter; it would never produce a sixpence. It seemed that the most that could be said for it was that it was worth while, because they were cutting away some wreckage which would impede the ship. His answer to that was that it was not wreckage that would impede the Gosport ship, but the Fareham ship, and it was unpardonable to load the thriving concern in Gosport with unproductive capital. Counsel then called attention to statements made in evidence by Mr. Cash and Mr. Valon, which were among the most illuminating statements he had ever heard. Mr. Cash had said they had tried to secure the Fareham undertaking for a lower price, but the Fareham Company would not sell under the price in the Order. There had been no endeavour, said Counsel, on the part of any responsible person to say that the undertaking had been sold at its real value. He hoped and believed that the Board of Trade would not encourage people to say, when applying for powers to acquire an undertaking, that they did not profess the price was a good one, but that it was the only price at which the owners would sell. But Mr. Valon had made a statement which was even more illuminating—namely, that the Fareham shareholder was entitled to a better price because he had enabled the Fareham consumer to get his gas cheaper from someone else. If there was one thing against which Parliament had set its face firmly, it was that a company should be allowed to make money out of dealing in its powers; and Mr. Valon's proposition meant that the Fareham Company were to receive a price for taking their hands off the throats of the Fareham consumers. After pointing out that he had not really been able to find out what the cash payment of £3200 to the Fareham Company represented, Counsel indicated what was really in the minds of the Gosport Corporation. They would be very happy, he said, to see this bargain thrown over. That would probably lead to the Fareham shareholders getting into a more reasonable frame of mind as to the value of the undertaking, and so coming to a more reasonable arrangement with the Gosport Company. Also, there was a gas-works at Porchester, which might see their way to make some arrangement with the Fareham Company, if the Gosport Company would not. For those reasons he ventured to think that if the Board of Trade threw out this Order it would be doing no disservice to the community. It might be that, for a short time, the consumers in Fareham would have to go on paying what was admittedly a very high price for gas. It remained to be seen, however, whether that could be justified. With regard to prepayment meters, Counsel said that the bulk of the consumers in Gosport were artisans connected with His Majesty's services, and the Corporation desired to see the prepayment system extended. If any alteration were to be made in meter payments, the Corporation would desire to see the whole of the working costs of the undertaking since the agreement with regard to meter payments was made. It was obvious that the Gosport Company had prospered since the 1923 Order was granted. The Corporation considered that it would be right and proper that the price of gas to ordinary consumers should remain up, or even increased, if necessary, rather than that anything more than was already extracted should be extracted from those who took their supply through prepayment meters.

Mr. ABADY, in a final summing-up, said that, if it could be shown that no burden would be thrown upon the consumers in the area of the acquiring Company, that the consumers in the acquired area would benefit, and that the price paid was not unreasonable, there appeared to be no reason, in the public interest, why the Board of Trade should not give assent to the provisional arrangement that had been come to by the two parties. If it could be shown that the price being paid for the undertaking to be acquired could be met by a reasonable differential price, and that the price of gas, when loaded with that differential, was still lower than the price which would prevail had the amalgamation not taken place, that showed that the price paid was not unreasonable. He directed attention to passages in the evidence of Mr. Valon and Mr. Evetts, to show that the proposals would benefit the Gosport consumers. As to the probable development, the scheme was not put forward, as had been suggested, as dependent on the rate of development along the line of the proposed high-pressure main. The evidence was that there would be development in Fareham, and that, in addition, along the route of the main there were houses which would take a supply of gas. With regard to the price to be paid for the Fareham undertaking, it was perfectly true that the Gosport Company had tried to fix a lower price, and had finally agreed to pay what the Fareham Company had demanded. But when the figures were examined, it came to this—that if this were an undertaking being sold under a compulsory purchase clause, and an arbitrator under the Lands Clauses Act took the view that the maintainable profit was £1393, and the appropriate number of years purchase was 16⅔, then the price would be as high as the price agreed upon in this case, adding the compensation. It had been admitted by Mr. Herring that the actual profits were considerably larger than the dividends paid.

In view of an indication by Mr. Honey that he would like some amended proposal made with respect to compensation, Mr. ABADY said the Directors would be willing that the bargain should go forward on the basis of seven years instead of ten, so far as they themselves were concerned. He had no proposal to make with regard to the Manager's compensation, but held that, on financial grounds, and on the grounds of equity and custom, the proposal contained in the Order was justified. As to whether anybody would have to be employed in Fareham to carry on any part of the functions at present carried on by the Manager, that was covered in Mr. Evetts's and Mr. Valon's estimates. With regard to prepayment meter supply, he said the position was that, owing to an error, the ordinary consumer was bearing part of the increased cost of the supply to the prepayment consumer which the latter ought to pay.

Mr. HONEY pointed out that he had had no evidence that the present prepayment price was unfair in itself, and did not think he could recommend the increased price without evidence.

Mr. ABADY said that the cost of supply through prepayment meters had increased, but the 2·6d.—the existing figure which he asked should be increased—represented the conversion of the pre-war cost.

Mr. TURNER (of Messrs. Lees & Co., Parliamentary Agents), on behalf of the Fareham Council, intimated that the Council could not accept any revision of the differential which had been agreed with the Gosport Company.

This concluded the hearing.

SOUTH BANK AND NORMANBY GAS COMPANY'S APPLICATION.

An inquiry was held by Mr. Honey on the 4th inst. into an application by the South Bank and Normanby Gas Light and Coke Company for a Special Order under section 10 of the Gas Regulation Act—the main object being an increase of the capital. There was some slight opposition on clauses. Our report of the proceedings is already in type, but unfortunately has had to be held over until next week.

GAS SUPPLY OF EDINBURGH.

Its History and Progress.

An outline of the history and progress of the supply of gas to Edinburgh was given last week by Mr. H. H. GRACIE, Chief Engineer of the Gas Department, to the Edinburgh Rotary Club.

In 1816, he said, the Edinburgh Gas Light Company was established, and in 1823 the Leith Gas Company started business. Keen competition existed for many years, until in 1866 the Companies entered into a districting agreement. The conditions laid down were apparently observed by both parties up to the time of transfer in 1888, when the business, works, and plant of both Companies were acquired by the Municipalities of Edinburgh and Leith, and the Edinburgh and Leith Gas Commissioners were incorporated by Act of Parliament. The Companies, who had a combined capital of £350,000, appeared to have conducted their operations in a highly successful manner, as they were able to pay a steady 10 p.ct. per annum. This was reflected in the purchase price which had to be paid when they were taken over—namely, the equivalent in annuities of £969,000. In the year 1896 the Portobello Gas Company's works and plant were also acquired. These manufacturing works were then closed down, and a high-pressure main laid from Edinburgh to the gasholder at Portobello. In this year, also, owing to the death of the Engineer at the Leith works, and the indifferent health of the Edinburgh Engineer, the Commissioners decided to have one engineer in charge of the entire undertaking, and Mr. W. R. Herring was appointed. The difficulties of maintaining an adequate supply of gas in face of the increasing demand were soon apparent, and consequent upon the congested state of the manufacturing stations it became necessary to look out for more accommodation. Mr. Herring examined the whole situation, and recommended the construction of new works at Granton. The new works were commenced in 1898, in accordance with the designs of, and to the specifications prepared by, Mr. Herring; the first section being completed in 1902 and the second in 1905, at a total cost of £850,000, including the land. Thus the undertaking was burdened with practically two capital expenditures before it had been long in the possession of the Commissioners. The Town Council were at present considering a scheme for the introduction of the most improved type of gas-generators, with the necessary motive power and mechanical plant of the latest design.

Proceeding, Mr. Gracie said: The outstanding capital debt is now a little over £1,000,000. To meet the interest and sinking fund charges and provide the necessary reserve funds, as laid down by the various Acts, requires a sum equal to nearly 1s. per 1000 c.ft.; and further burdens are the local and Imperial taxes, which together represent a little over 8d.—a total of 1s. 8d. per 1000 c.ft. Taking the present price of gas—3s. 8d. for ordinary purposes—and subtracting this amount, leaves 2s. per 1000 c.ft. as the net amount over to pay for all materials and wages required for manufacture and distribution, repairs and maintenance, provision and upkeep of gas appliances (such as cookers, fires, &c.), management, and all incidental expenses. This figure of 2s. per 1000 c.ft. is equal to 4·8d. per therm under the new method of charge. The total revenue last year amounted to £654,000.

The maximum day's output is now almost 12 million c.ft., which is a record for the department, and an increase of 1 million c.ft. as compared with the maximum day last year. The total make of gas in 1890 was 1,273,000,000 c.ft., and it is now 2,650,000,000 c.ft., an increase of 1,377,000,000 c.ft., which shows that the output has been more than doubled during the past 33 years. The increase is equivalent to the entire output of a town of the size of Aberdeen. The additional make for the current year is already 160,000,000 c.ft., or about 8 p.ct. in excess of last year. The number of consumers in 1890 was 65,000; it is now 110,000—an increase of 70 p.ct. The gas is distributed over an area of 50 square miles, through 460 miles of mains varying in size from 2 in. up to 48 in. in diameter. There are, in addition, over 1000 miles of service pipes, conveying the gas from the mains to the meters, of which there are about 115,000.

The price of gas to ordinary consumers is 3s. 8d. per 1000 c.ft., and for power and industrial use 3s. 2d. This is only 37½ p.ct. above the price charged prior to the war, and there is still being paid nearly 100 p.ct. more for coal and labour. The price of gas in 1921 was 5s. 8d. per 1000 c.ft., so that there has been a reduction of 2s., which represents a saving of £240,000 per annum to the consumers. The wages bill amounts to £140,000 a year, and direct employment is given to more than 1000 persons. There are now 70,000 gas appliances on loan and hire, represented by cookers, fires, and other apparatus. It is the ambition of the department that a gas cooker and at least one gas-fire should be installed in every home. One could then visualize a really smokeless city. The Gas Commissioners applied for an Order under the Gas Regulation Act, stipulating a standard of 500 B.Th.U., and gas is now being supplied in conformity with this.

Price Reduced at Abertillery.—The Abertillery Urban District Council Gas Committee have reduced the price of gas as and from April 1 by 1d. per therm, equal to 4·3d. per 1000 c.ft.

Calorific Value of Gas in South London.—At the last weekly meeting of the London County Council, in reply to Mr. J. D. Gilbert, M.P., Mr. Cyril Jacobs (Chairman of the Public Control Committee) gave particulars of the statutory obligations of the South Metropolitan and Gas Light and Coke Companies as regarded the calorific value of gas supplied to South London consumers from 1914 to 1923. He stated that the two Companies had on two occasions declared the calorific value of their gas—on the second occasion declaring a higher figure. The South Metropolitan Company in 1920 declared at 550 B.Th.U., and in 1922 at 560 B.Th.U.; the Gas Light and Coke Company in 1921 declared at 475 B.Th.U., and in 1922 at 500 B.Th.U. For the whole period from 1914 to 1923 the average annual calorific value of the gas supplied by the former Company had varied between a maximum of 565·2 B.Th.U. and a minimum of 551·7 B.Th.U., and that of the Gas Light and Coke Company between a maximum of 535 B.Th.U. and a minimum of 475·3 B.Th.U.

GLOUCESTER GAS LIGHT COMPANY.

The General Meeting of the Company was held on Friday, Feb. 29—Mr. J. H. JONES (Chairman of the Directors) presiding.

In proposing the adoption of the report, the CHAIRMAN said the figures disclosed an excellent position. Hitherto the Company had carried on their business more or less in camera. Henceforth they proposed to have yearly meetings, instead of half-yearly ones. Last year the price of gas was reduced by 9d. per 1000 c.ft. This was rather a bold step, for 9d. was a greater reduction than the balance in hand justified; but the present accounts showed they were right, and the profits were sufficient to pay a 5 p.ct. dividend and mortgage interest, and also leave a surplus. The Company hoped that all in Gloucester were now satisfied that any increased charge for consumption was not due to the change to the therm. The gas now being sent out in Gloucester gave satisfaction. The Board proposed to lay a 24-in. trunk main from Stroud Road *viâ* Weston Road, Parkend Road, Station Road, Market Parade, and London Road, as far as Denmark Road. This large main would cost between £15,000 and £16,000. The accounts before them showed that the existing capital was already overspent by £11,700, so that at no distant date it would be necessary to ask the shareholders or the public for more money. As showing how the stability of the Company had increased, in 1878 (after scrapping the old works) the capital outlay amounted to £735 per million c.ft. of gas sent out. In 1920 it was about £565 per million, and now about £531. The Company's relations with employees of all grades continued excellent, and they considered they had a splendid lot of men with them. The 9d. reduction in price had produced a larger addition to the co-partnership funds than had been made since the bonus scheme was started in 1908.

The DEPUTY-CHAIRMAN seconded the motion, which was carried.

It was agreed to declare a dividend of 5 p.ct., less income-tax, on the consolidated stock for the half-year.

WAGES AT BARROW.

The Barrow Gas and Water Committee reported to the Town Council on Monday of last week that they had resolved: "That notice be given to all employees concerned in the Gas and Water Departments that the present wages and hours and conditions of employment will cease to operate on March 15 next, and that the rates of pay and hours and conditions of employment as shown in the schedules issued from time to time by the Manchester Regional Joint Industrial Council and the Lancashire and Cheshire Counties District Council (No. 9) for the Water-Works Undertakings Industry respectively, and also any awards as to increases or decreases issued by such Councils, will come into operation as soon as practicable after such date; and that the Gas-Workers' Wages and Gas and Water Works Sub-Committees jointly be requested to negotiate with the employees' representatives as to the method to be adopted in bringing the present wages and hours and conditions of employment into line with those set forth in the schedules."

Alderman J. WHINNERAH (the Chairman of the Gas and Water Committee), in moving the adoption of this, said that there was a possibility of a strike taking place. The trouble arose from two causes: (1) Variation in the amount of bonus paid; and (2) variation in cost-of-living figures used to determine wages. As a result of these variations, the Barrow gas and water works wages were higher than those fixed by the Regional Council. For instance, Salthouse branch gas-works stokers had £1 5s. 11d. per week more, and labourers 2s. 5d. per week more. The Committee felt that, as the Regional Council were composed of an equal number of workers' and employers' representatives, and the wage fixed was an agreed wage, they had a perfect right to ask their workers to come down to that wage. The men were resisting, but the Committee thought they were right in proceeding with the cut. The facts behind the Committee's case were: (1) The wages the Committee proposed to pay were those fixed by the Joint Industrial Council, except in the case of shift workers, whose wages would still be above the award; and (2) the Committee had been influenced by a comparison with pre-war wages. Labourers would be receiving £2 8s. 7d. under the Regional scale for a 47-hour week, against Barrow shipyard riveters £2 4s. 6d., platers £2 6s. 9d., joiners £2 9s., and engineers £2 16s. The consumption of gas was down from the maximum output in 1917-18 of 410,345,000 c.ft. to 279,511,000 c.ft. in 1922-23—a reduction of more than 25 p.ct., yet the number employed was one man more. The reductions would vary from 9s. 4d. to 10d. per week. All that the Committee wanted to do was to get down to the Regional Council schedule rates, and then any variations due to the cost of living would be made as they came along.

The Council unanimously approved the recommendation.

On behalf of the men, it has since been pointed out that what the workers have asked for is arbitration, and that this has been declined.

Harpenden Capital Issue Over-Subscribed.—The issue of £7000 of ordinary share capital in the Harpenden District Gas Company recently made by Messrs. A. & W. Richards was considerably over-subscribed. The tenders sent in ranged from £109 down to the minimum of £105 per £100 of stock.

Proposed Reduction at Manchester.—The Manchester Gas Committee propose to reduce the price of gas by 3d. per 1000 c.ft., and a report of the Finance Committee on the proposal has been prepared for the City Council. The present charge is 3s. 5d., less 2d. discount. Large consumers are promised bigger reductions. In order to encourage the more general use of the gas-fire and gas-cooker in the average household, the Committee intend to reduce the price by an additional 1d., making 4d. in all, where the "consumption falls within the grade of 20,000 to 250,000 c.ft. on one premises per quarter." A reduction of 6d. per 1000 c.ft. is to be made in respect of gas for street lighting.

City of Chichester Gas Company.—The undertaking has now passed its centenary, for a supply of gas was first given to the citizens of Chichester in the year 1823. At Dec. 31 last the balance standing to the credit of the profit and loss account amounted to £6087; and after payment of the dividend recommended, a balance of £4519 remains to be carried forward.

Wellingborough Gas Light Company, Ltd.—The Company have reduced their scale of charges for meter-rents by about one-third as from Jan. 1. The profit for the half-year to Dec. 31, after providing for interest, amounted to £5288; and this, added to the balance brought forward, gave an available sum of £10,424. Out of this the Directors recommended, at the recent meeting, dividends of 7½ p.ct. on the original and 6 p.ct. on the additional shares, less income-tax, for the six months, and that £575 be placed to reserve, leaving £6002 to be carried forward.

Canterbury Gas and Water Company.—It was reported at the annual meeting that the sales of gas for the past year, as compared with 1922, showed a slight decrease of about 2 p.ct. From the meter readings for the March quarter, 1923, the price of gas was reduced from 12·8d. to 12d. per therm. After payment of interest on the loan capital, there remained at disposal £6497. An interim dividend of 4 p.ct. has been paid, and the Directors recommended a further payment of 5 p.ct., making the dividend on the total capital 9 p.ct., less income-tax, for the year.

Winchester Water and Gas Company.—It was reported at the recent meeting that the balance of net revenue for the half-year ended Dec. 31 available for dividend, after transferring £250 to the reserve fund account, was £5911; and the Directors recommended the payment of a dividend on the consolidated ordinary stock at the rate of 5 p.ct. per annum (less income-tax) for the half-year. They propose making a further reduction of 1d. per therm (4½d. per 1000 c.ft.) in the price of gas, to take effect as from Lady Day next, reducing the price to 1s. per therm (4s. 6d. per 1000 c.ft.).

Sittingbourne District Gas Company.—The profit of the Company for the year 1923 amounted to £4723, and with the carry forward there was, after deducting mortgage interest, a sum for disposal of £8695. The Board expressed their pleasure at being in a position to submit figures of so satisfactory a character, and recommended dividends (less tax) on the original ordinary shares of 7½ p.ct. and on the additional ordinary shares of 5¼ p.ct., leaving a balance of £5290 to go forward to the current year. Gas sales during the year improved steadily, and prices have been further reduced.

Weston-super-Mare Gas Light Company.—At the meeting on the 29th ult., the Directors reported that the sales of gas in 1923 amounted to 1,505,082 therms, or 334,462,700 c.ft., an increase of 10,580,000 c.ft., or 3¼ p.ct., over 1922. They recommended the payment of the maximum dividends of 5 p.ct. on the ordinary stock and 6½ p.ct. on the 6½ p.ct. redeemable preference stock for the half-year ended Dec. 31, less income-tax. The sum of £2000 has been placed to the reserve fund, bringing the total up to £15,281; and £2260 has been added to the special purposes fund, making it £6129. The declared calorific value of the gas was increased as from Jan. 1 last to 475 B.Th.U. The Directors believe that this increase in the heating quality of the gas will be appreciated by the consumers.

Colchester Gas Company.—The half-yearly meeting of the Company was held on Feb. 22—Mr. W. Gurney Benham (Chairman) presiding. The Directors' report for the year stated that the sales of gas had increased from 233 to 237 million c.ft.—or slightly under 2 p.ct. The gross profit on the past half-year's working was £8572, after charging to the accounts £500 for superannuation, and making adequate allowance for depreciation. The Directors had decided to make a further reduction in the price of gas, to take effect from Jan. 1. The reduced price would be 10d. per therm. The dividends recommended were: On the "A" shares at the rate of £6 7s. 6d. for the half-year; and on the "B" shares at the rate of £4 9s. 3d. The Chairman referred to the excellent work of the Company's Engineer and Manager (Mr. W. Townsend).

Harrogate Gas Company.—The past year was a very successful one for the Company; the revenue account showing a profit of £24,231, and the balance of net revenue being £27,667. At the meeting of proprietors, the Directors recommended the payment of the statutory dividend of 10 p.ct. for the year on the consolidated ordinary stock, a co-partnership bonus, and the appropriation of an amount towards the formation of a superannuation fund. From Jan. 1 last, the gross price of gas has been reduced to 8d. per therm, which is subject to a discount of 10 p.ct. for prompt payment, and is the equivalent of 2s. 9d. per 1000 c.ft. net. The Directors aim at supplying gas at the lowest possible rate of charge, and this reduction is the fourth which has been made since Dec. 31, 1921. The sales of gas show an increase of 14,000,000 c.ft., or 64,100 therms, notwithstanding the very mild weather experienced in the early part of last year.

Bishop's Stortford, Harlow, and Epping Gas and Electricity Company.—In the report which was submitted at the annual meeting on the 27th ult., the Directors stated that the sale of gas for 1923 (683,433 therms) was 2·1 p.ct. more than that for the preceding year. The sale of electric current (38,604 units) was 30 p.ct. more. The net balance of revenue credited to the profit and loss account was £11,212. Adding thereto £180 received for interest and the balance brought from the previous year, and deducting interest charges, income-tax, &c., and the sum of £1000 written off the amount paid and outstanding for capital and conveyance duty, left an amount of £7532 available for distribution. Dividends (less income-tax) were declared for the year at the rates of £5 14s. p.ct. on the "A" ordinary stock and £5 10s. p.ct. on the "B" ordinary stock. A balance of £600 remained to be carried forward. A reduction in the price of gas of ½d. per therm (from 1s. 3d. to 1s. 2½d.) was made as from Michaelmas, 1923. The Directors have decided to make a further reduction of the same amount, to take effect as from Lady Day, 1924. These reductions (from 1s. 3d. to 1s. 2d. per therm) together are equivalent to 5d. per 1000 c.ft., and represent a diminished charge to the consumers of £2800 per annum. Added to those referred to in the previous Directors' report (which amounted to 1s. 3d. per 1000 c.ft.), they represent, in total, a diminished yearly charge to the consumers of £11,160.

Hartlepool Gas and Water Company.—The annual meeting was held on Feb. 28. The profit for the year, including the amount brought forward from the previous year, totalled £46,831; and after paying interest on mortgages, debentures, &c., and an interim dividend of 2½ p.ct., less tax, there remained an available balance of £25,604. The Directors declared a final dividend of 2½ p.ct., less tax, leaving a balance of £12,584 to carry forward. The price of gas has been reduced, as from the December meter readings, from 8¼d. to 7½d. per therm.

Great Yarmouth Gas Company.—The report and accounts for the year ended Dec. 31 last show that, after setting aside a sum of £5000 for deferred renewals of plant, the net profit for the year amounts to £8606. The sales of gas show an increase of over 6¾ million c.ft. (4¾ p.ct.). To avoid the heavy cost of transport and to ensure more economical and efficient working, the Company's tar works have been removed from the site on Caister Road to the gas-works. Final dividends for the half-year were recommended at the following rates per annum: 8½ p.ct. on the original and quarter shares; 7½ p.ct. on the new £30 shares, less income-tax.

Isle of Thanet Gas Company.—The annual meeting of the Company was held at Margate on Feb. 22—Mr. Walter Hills (Chairman) presiding. The turnover for the year was £129,564, and the net profits amounted to £11,877, which, with the carry-forward of the previous year, made an available sum of £18,044. After all allocations had been made, a carry-forward of £8570 remained. The Directors decided to reduce the price of gas from 10d. to 9d. per therm. In moving the adoption of the report and accounts, the Chairman referred to the excellent work of Mr. J. M. Campbell (Engineer and General Manager) and Mr. A. J. Stickels (Secretary). A dividend at the rate of 7 p.ct. per annum was declared.

Uxbridge and Wycombe Gas Company.—Mr. H. E. Jones presided at the annual meeting of the Company held on March 6. In reviewing the year's work, the Chairman said that there was an increase of 6·9 p.ct. in the sale of gas, and that they had 17,320 consumers using 11,148 stoves. They had made three reductions in the price of gas, amounting in all to 3·1d. per therm; and this month it was their intention still further to lower the price—this time by another 1d. per therm. Reference was made to the acquisition of the Maidenhead Gas Company; and the Chairman reported that the Order had passed the House of Commons and would go through the House of Lords this week. The amalgamation would increase their obligations and responsibilities. The Directors recommended the payment of dividends at the following rates per annum: 5 p.ct. on the 5 p.ct. preference stock, 5½ p.ct. on the 5½ p.ct. preference stock, and 6½ p.ct. for the first, and 6¾ p.ct. for the second half-year on the ordinary stock.

Worthing Gas Light and Coke Company.—Resolutions relating to the raising of further capital were submitted at an extraordinary meeting of the Company which followed the half-yearly meeting on the 23rd ult. New capital is required to discharge an existing overdraft and to provide for capital expenditure rendered necessary by the growth of the business. In view of the increased sales of gas, amounting to 9½ p.ct. for the half-year, the Directors decided further to reduce the price to 12d. per therm (a reduction of 2d. per 1000 c.ft.) as from the Christmas readings of the meters. The sum of £15,000 advanced to the Company on mortgages at 6 p.ct. interest became repayable on Jan. 1 and has been renewed at the reduced rate of 5½ p.ct. The Company's co-partnership scheme has been successfully inaugurated. A balance of £22,479 was shown on profit and loss account, and out of this the Directors recommended a dividend of 6 p.ct. per annum (less income-tax) upon the consolidated ordinary stock of the Company for the half-year ended Dec. 31.

Watford Gas and Coke Company.—The general meeting of the Company was held on Feb. 28; the chair being occupied by the Deputy-Chairman (Mr. F. Harding Jones). In moving the adoption of the report and balance-sheet, Mr. Jones said that, during the year, the Directors had given special attention to mains, to cope with the increased demand for gas. The gas sold showed an increase of nearly 20 million c.ft. over the previous year's sales; and residual products, especially tar, had realized good prices. During the year, gas had been reduced by 2d. per therm, and its calorific value raised from 475 to 500 B.Th.U. per c.ft. A further reduction of 1d. per therm had been made on Jan. 1 last. The revenue account showed a profit of £19,513, and the profit and loss account a balance of £11,919, after providing for interim dividend and other charges. The Directors recommended that dividends of 8 p.ct. per annum on the "A" stock, and £6 10s. p.ct. per annum on the "B" stock, less income-tax, be declared. They also recommended that £500 be placed to the reserve fund. The Chairman said that in the year under review they had sold the biggest amount of gas in the history of the Company; the increase over the previous year being 7 p.ct.

Tunbridge Wells Gas Company.—The Directors were able to report at the annual meeting of proprietors that the accounts for the year ended Dec. 31 showed that the business of the Company continued to make satisfactory progress. The profit and loss account, after payment of an interim dividend and all fixed charges, showed a balance, including the amount brought forward, of £20,199, out of which the Directors recommended a dividend for the past half-year at the rates of 13 p.ct. per annum on the consolidated ordinary stock, 10½ p.ct. per annum on the consolidated "B" stock, and 10 p.ct. per annum on the consolidated "C" and "D" stocks. This will absorb £5071 (after deduction of income-tax), leaving £15,128 to be carried forward. The price of gas was reduced from the Lady Day meter readings to 10d. per therm (equal to 3s. 9d. per 1000 c.ft.), and from the Michaelmas readings to 9¾d. per therm (equal to 3s. 6·3d. per 1000 c.ft.). The highest price charged during the war period was 4s. 9d., and the various reductions represent a total decrease in the price charged of nearly 1s. 3d. per 1000 c.ft. during the past two years. The reductions during the year were followed by a 3¾ p.ct. increase in the sale of gas. The income from residuals materially contributed to the financial results obtained. Acknowledgment was made of the good services rendered by the Secretary (Mr. C. F. Catt) and the Engineer (Mr. L. J. Langford). In response, Mr. Catt remarked that he had been connected with the undertaking for forty years, and Mr. Langford declared that they were "a very happy Company."

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There is no great change to record in the market during the past week. Prices remain about the same, and business is not brisk in any department; the tendency, if anything, being rather less firm. The tonnage position is by no means satisfactory, and, though most collieries are well enough stemmed on paper, boats are being delayed by climatic conditions, and are arriving late. No great additional demand due to fears of labour trouble is noticeable. There is no doubt that quiet stocking has been going on for some time, and buyers now are rather inclined to take a more optimistic view of the chances of a peaceful settlement. The impetus given recently to the gas-coal section by the big London companies being in the market has subsided, it being understood that their requirements have now been satisfied, on approximately the basis indicated here recently. As to Continental demand, Germany is very quiet, and France and Belgium are naturally affected by the serious slump in their exchange rates.

The general outlook, therefore, does not point to features making for any great strength; the maintenance of values depending probably more than anything upon the uncertainty of the labour outlook. Coking unscreened is about 23s. to 23s. 6d. f.o.b. for good qualities, with very limited demand for smalls. Best gas makes quote 25s., and are supported by heavy deliveries under contract, so that they have not much free coal. But this figure is certainly rather on the high side for actual business. Seconds ask 23s. to 24s.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From Our Local Correspondent.

There is a very marked activity in all sections of the coal trade of Yorkshire and Lancashire at the present time, owing to the menace of a miners' strike. Consumers of house, industrial, and gas coal are endeavouring to lay in stocks, and in consequence there is a tendency to increase prices. Figures that are now operating in regard to prompt deliveries of steam coal are not a commercial proposition. There appears to be a lull in the demand for coals for shipment, possibly owing to the higher rates of exchange to the nearer Continental countries.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

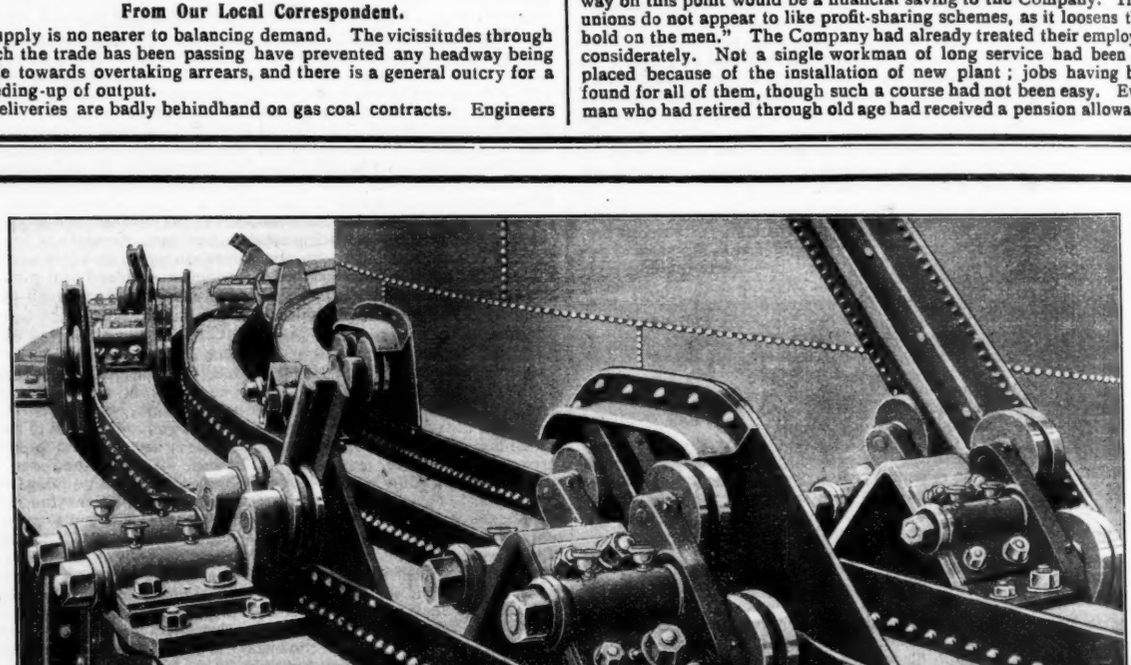
Supply is no nearer to balancing demand. The vicissitudes through which the trade has been passing have prevented any headway being made towards overtaking arrears, and there is a general outcry for a speeding-up of output.

Deliveries are badly behindhand on gas coal contracts. Engineers whose accommodation for stocking is limited are casting about in all directions to reinforce their regular supplies. There are, however, very few spot lots to be had. Collieries have with few exceptions done what was possible to fulfil their engagements. Notwithstanding the pressure in the open market, prices have not often exceeded about 24s.

In the case of household coals there has been a further sharp advance this month. London agents have been in the Midlands offering premiums of as much as 3s. above the enhanced list prices for prompt supplies. It does not appear that they have had much success, however. Steams and other industrial grades are now making on an average 2s. to 3s. more than at the beginning of February. Some collieries have exercised great restraint; others have advanced quotations as the stringency has increased. In a number of cases orders have been accepted only at the price ruling at the time of execution. Best grades of house coal have been round about 37s. 6d. at the pit. The situation is cited as confirmation of the incompatibility of a seven-hour working day with any elasticity of demand. Transport difficulties have not disappeared, and adverse weather conditions have prevailed; but the pits have been working fairly regularly, the influenza epidemic having abated. The fact remains that sufficient coal is not being drawn to overtake demand.

Trade Unionism and the Taunton Gas-Works.

The Secretary of the Taunton Gas Company (Mr. C. Harris) has issued a reply to statements made by Mr. J. M. Boltz, Trade Union Organizer, of Bridgwater, respecting the conditions of labour at the Taunton works, which he had declared were "worse than anything he had seen in this country." The statements were made at a Labour demonstration at which Mr. Boltz appealed to Taunton workers to support the men employed at the gas-works in demanding better conditions and better pay. Mr. Harris, in his reply, states that trade-union rates have been paid at the Taunton works during the past four years. The Taunton workers, Mr. Harris added, had applied to be graded on the same basis as those at Weston-super-Mare; and this application was at present under the consideration of the Regional Council. The decision was for the court to give—not Mr. Boltz or the Gas Company. The Company had already given several shillings per week per man more than they would have done under the national awards, as they had not made the 12½ p.ct. reductions which they were entitled to make. "The Trade Unions," says Mr. Harris, "are pushing 4d. per shift, or 2s. per week, in place of the co-partnership and pensions scheme which the Company are introducing; and to give way on this point would be a financial saving to the Company. Trade unions do not appear to like profit-sharing schemes, as it loosens their hold on the men." The Company had already treated their employees considerately. Not a single workman of long service had been displaced because of the installation of new plant; jobs having been found for all of them, though such a course had not been easy. Every man who had retired through old age had received a pension allowance.



THE NEW "BEARSCOT" TWIN GUIDE ROLLERS

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MANCHESTER.

STOCK MARKET REPORT.

BUSINESS was again restricted on Exchange last week. The fears that have been entertained that the approaching Budget would bring with it an increase in the income-tax are gradually being dispelled; the reductions in the estimates showing that the Labour Government intend carrying out the policy of the previous administration.

The adverse feature of the week was the further depreciation in both French and Belgian francs, and French Rentes and Rails naturally fell away in consequence. There was also considerable selling of other French securities.

The state of the Industrial Market showed that investors, as well as business men generally, are watching the progress of the various conferences on labour claims, the principal of which is that of the miners and mine owners; but it is evident by the steadiness of prices that it is anticipated that a settlement will be arrived at without the necessity on the part of the former to resort to the disastrous remedy of a general strike. Textiles showed moderate gains, and London Stores were in demand on the excellent results disclosed by the accounts for the past year.

In the Gas Market nothing of a startling nature was recorded, but we understand the reports of further increases in the cost of living are a matter of concern to gas administrators. The following price changes, other than *ex* div. quotations, took place on the week: Rise—Alliance and Dublin ordinary 2, to 70—73; Montevideo 1, to 54—59; San Paulo 6 p.ct. preference ⅛, to 5⅞—6⅛. Fall—Continental Union ordinary 3, to 25—30, 7 p.ct. preference 3, to 75—80; European ¼, to 5¼—6¼.

The following transactions were recorded during the week: On Monday, Brentford "A" 99, 100 *ex* div., Brighton and Hove 177½, 178½, British 123, Gas Light and Coke 91, 91½, 91⅛, 91¾, 4 p.ct. preference 78½, 78⅛, Imperial Continental 145⅝, 146½, 147, Liverpool 7 p.ct. preference 107⅛, Montevideo 54, 55, 55½, 57, 57⅛, 58, Primitiva 5 p.ct. preference 33s. 9d., 34s., 4 p.ct. (Buenos Ayres) new debenture 56, 4 p.ct. debenture (1911) 54½, South Metropolitan 95¾, 3 p.ct. debenture 58¾, 59½, 6½ p.ct. debenture 104½, South Suburban 5 p.ct. 97 *ex* div. On Tuesday, Alliance and Dublin 69¾, 70, 70½, Brentford "B" 100 *ex* div., British 121½, Commercial 4 p.ct. 96, 97⅜, European 6, Gas Light and Coke 90¾, 91, 91⅛, 3½ p.ct. maximum 61¾, 4 p.ct. preference 78¼, 78½, 78¾, 3 p.ct. debenture 58¼, Imperial Continental 145, Primitiva 5 p.ct. preference 33s. 6d., South Metropolitan 95¼ *ex* div., 6½ p.ct. debenture 105, South Suburban 5 p.ct. 99 *ex* div., Wandsworth "B" 117. On Wednesday, Cape Town 4½ p.ct. preference 6 9/16, Commercial 4 p.ct. 94, 3 p.ct. debenture 57½, Gas Light and Coke 90½, 90⅝, 91, 91¼, 91⅜, 91½, 3½ p.ct. maximum 61, 4 p.ct. preference 77, 77½, 78¼, 78⅜, Imperial Continental 145, 146, Liverpool 7 p.ct. preference 107½, Oriental 101, 102, Primitiva 8s., South Metropolitan 95¼, 95⅜ *ex* div., 6½ p.ct. debenture 104⅝, Tottenham "B" 99½, 99⅝, 99¾. Supplementary prices, Bath 94½, Croydon 4 p.ct. debenture 78. On Thursday, Alliance and Dublin 70, 70¼, 70⅝, 70⅞, Bombay 5½, Bristol 89¾, Commercial 4 p.ct. 92, 92½, 93, 95 *ex* div., Continental Union 7 p.ct. preference 75, 76, Gas Light and Coke 90½, 91⅛, 91⅛, 91½, Imperial Continental 146, Primitiva 8s. 1½d., 5 p.ct. preference 32s. 6d., 33s. 4½d., 33s. 6d., South Metropolitan 95, 95⅜, 95⅝, 96, South Suburban 5 p.ct. debenture 95½, 96½, Tottenham 4 p.ct. debenture 80. On Friday, Alliance and Dublin 71½, 72½, Bombay 5 1/16, 5⅛, Brighton and Hove "A" 124, 126 *ex* div., British 120½, Cape Town 7½, Continental 25, European 5 11/16, 5⅞, Gas Light and Coke 92½, 91⅛, 91¼, 4 p.ct. preference 78¾, 79, Imperial Continental 142½, 144, Lea Bridge 95 *ex* div., Liverpool 7 p.ct. preference 107, 107½, Primitiva 8s., 5 p.ct. preference 34s., South Metropolitan 95¼, 96, South Suburban 5 p.ct. debenture 96½, 96⅛, Tottenham "B" 100, 100½, Wandsworth (Epsom 3 p.ct. debenture) 58. Supplementary prices, British (Norwich) 7½ p.ct. debentures 103.

The weakness of the French franc was accentuated by the big increase in the note circulation, and reached the record figure of 117⅜. Belgian francs also set up a new record of 132½. The dollar-sterling was affected by the selling on New York account of francs *via* sterling, and the rate dropped to $4.27½c.

In Lombard Street on Friday both loan and discount rates declined. The chief factor which depressed discount quotations was the unexpected low rate at which the Treasury Bills were allotted; the average rate being over 3s. lower than a week ago at £3 3s. 4·05d.

The cash price of silver showed an improvement on the week of 1/16d. per oz. at 33½d. per oz.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, March 7.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Feb. 7	—	5	Aldershot 5 p.c. max. C.	..	70—75	...
217,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	70—73	69¼—72½
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5½—6½	5—5½	5 1/16—5⅛
100,000	10	Mar. 6	—	8½	Bournemouth Gas and Water { 5 p.c.	..	12—13*	
383,110	10	,,	7	7	Bournemouth Gas and Water { B 7 p.c.	15—15½	11½—12½*	...
115,000	10	,,	6	6	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	10½—11½*	...
162,025	—	Dec. 28	—	4	Bournemouth Gas and Water { 4 p.c. Deb.	..	75—80	
992,045	Stk.	Feb. 21	—	6 5/16	Brentford A Consolid.	..	99—101	99—100
734,920	,,	,,	—	6½	Do. B New	..	96—101	100
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	89—94*	...
221,400	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	91—93	76—81	...
214,740	,,	Mar. 6	11	11½	Brighton & Hove Orig.	208—213	170—175*	177½—178½
244,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	124—127*	124—126
1,287,500	Stk.	Feb. 21	—	5	Bristol 5 p.c. max.	..	90¼—91⅛a	89⅛
855,000	,,	—	—	—	British Ord.	..	120—125	120½—123
100,000	,,	—	—	7	Do. 7 p.c. Pref.	..	120—125	...
120,000	,,	Dec. 28	4	4	Do. 4 p.c. Deb. Stk.	88—90	73—78	...
100,000	10	,,	—	6	Cape Town & Dis., Ltd.	1½—2½	6⅛—7⅛	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	6 9/16—7⅛
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	105—110	...
157,150	,,	Mar. 6	5	5	Chester 5 p.c. Ord.	108—110	82½—87½b*	...
1,513,280	,,	,,	5/9/4	6	Commercial 4 p.c. Stk.	106—108	90—95*	92—97½
360,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	90—91*	...
475,000	,,	Dec. 13	3	3	Do. 5 p.c. Deb. Stk.	69½—71½	56—60	57½
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	25—30	25
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	75—80	75—76
660,000		Mar. 6	—	6½	Croydon sliding scale.	..	99—104*	...
284,975		,,	—	5	Do. max. div.	..	83—86*	...
492,270	Stk.	Feb. 21	6	4½	Derby Con. Stk.	125—125	108—110c	...
55,000	,,	Jan. 12	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	—	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 24	10	2	European, Ltd.	17½—18	5½—6½	5 1/16—6
16,146,120	Stk.	Feb. 7	4/17/4	5½	Gas Light and Coke { 4 p.c. Ord.	98—102	90½—91¾	90½—91⅜
2,600,000	,,	,,	3½	3½	Gas Light and Coke { 3½ p.c. max.	76—79	60—63	61—61⅛
4,062,235	,,	,,	4	4	Gas Light and Coke { 4 p.c. Con. Pref.	96—99	76—79	77—79
4,761,930	,,	Dec. 13	3	3	Gas Light and Coke { 3 p.c. Con. Deb.	72½—74½	57—60	58½
130,000	,,	Dec. 11	10	10	Gas Light and Coke { 10 p.c. Bonds	—	..	...
42,000	—	—	—	7½	Gas Light and Coke { 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	..	93—98	...
858,740	,,	,,	3½	5⅛	Do. 3½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16⅝	16—17	...
86,600	Stk.	—	9	10	Hornsey 7 p.c.	..	140—145*	...
1,976,000	,,	Nov. 13	9	5	Imperial Continental	150—160	140—145	142½—147
401,400	,,	Feb. 7	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	72—75	95
235,242	,,	—	6¼	6¼	Lea Bridge Ord. 5 p.c.	119—121	93—97*	...
1,127,340	,,	Feb. 21	—	5½	Liverpool 5 p.c. Ord.	—	8½—89½b	107—107½
600,000	,,	Sept. 19	—	7	,, 7 p.c. Pref.	..	100—109b	...
165,736	,,	Feb. 21	7/5/6	8	Maidstone 5 p.c.	—	124—129	...
63,480	,,	Dec. 28	—	—	Do. 5 p.c. Deb	..	54—59	...
75,000	5	Dec. 13	6	5	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4¾	3⅜—3⅝	...
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
341,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'd Con.	..	54—59	54—58
1,875,892	,,	Mar. 6	4½	5½	Do. 4 p.c. Pref. Stk.	98½—99½	86—87d*	...
250,166	,,	,,	—	4	Do. 3½ p.c. Deb.	..	73—75d*	...
329,705	,,	Dec. 28	3½	3½	North Middlesex 10 p.c.	82—83	72—73d	...
15,000	10	Mar. 6	—	11	,, ,, 7 p.c.	—	16—17*	...
75,940	10	,,	7/14/0	7 7/10	Oriental, Ltd.	14—15	11½—11¾*	...
300,000	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102	101—102
138,120	Stk.	Dec. 28	—	7½	Portsea Island, B	..	107—112	...
60,000	50	Mar. 6	13	13	Do. C	128—131	102—105*	...
100,000	50	,,	12	12	Primitiva Ord.	118—121	98—103*	...
1,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5½—6	⅛—⅛	8/—8/1½
2,499,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4¾—5	1½—1¾	32/6—34/-
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75	...
600,000	Stk.	Jan. 24	4	4	Do. B. Aires 4 p.c Deb.	—	54—57	54½
220,335	,,	Dec. 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	56
321,670	,,	,,	4	4	San Paulo { 6 p.c. Pref.	83—87	55—58	...
150,000	10	Oct. 4	6	6	San Paulo { 5 p.c. Deb.	10½—11	5⅛—5¾	...
125,000	50	Jan. 2	5	5	Sheffield A	47—49	37—40	...
270,000	Stk.	Aug. 23	—	5	Do. B	..	100—102e	...
419,968	,,	,,	—	5	Do. C	..	100—102e	...
1,047,000	,,	,,	—	5	Shrewsbury 5 p.c.	..	100—102e	...
133,201	Stk.	,,	—	5	South African	—	..	...
90,000	10	Oct. 18	4	6	South Met. Ord.	10½—11½	7—9	...
5,609,895	Stk.	Feb. 21	9	6	Do. Red. Pref.	111—113	94—96	95—96
102,580	,,	Jan. 10	5/9/4	6¼	Do. 5 p.c. Deb.	—	98—100	...
1,895,445	,,	,,	—	5	Tottenham { A 5 p.c.	72½—74½	57—60	58½—59½
734,000	,,	Mar. 6	5	5	Tottenham { B 5½ p.c.	..	102—104*	104½—105
91,500	,,	Aug. 23	—	6½	Tottenham { C 5½ p.c.	..	102—104*	...
1,087,795	,,	Feb. 21	8½	8½	South Shields Con. Stk.	157—159	136—138d	...
368,837	,,	Dec. 28	6	6¼	S'th Suburb'n Ord. 5 p.c.	114—116	95—100	97—99
647,740	,,	Nov. 15	5	5	Do. 5 p.c. Deb. Stk.	116—118	95—100	95½—96½
121,275	,,	Dec. 28	5	5	S'th'mpt'n Ord. 5p.c. max	99—102	86—89	...
250,000	,,	Mar. 6	4	4	Do. 4 p.c. Deb. Stk.	..	74—79	...
200,000	,,	Dec. 28	—	7	Swansea 7 p.c. Pref. Stk.	..	100—102*	...
130,000	,,	Dec. 28	—	6½	Do. 6½ p.c. Deb. Stk.	..	102—104	...
882,275	,,	Feb. 21	—	8	Tottenham { A 5 p.c.	135—138	119—124	...
181,255	,,	,,	6	6½	Tottenham { B 5½ p.c.	115—117	98—103	99½—100½
258,251	Stk.	Dec. 13	4	4	Tottenham { 4 p.c. Deb.	87—89	77—81	80
		Aug. 23	5	5	Tynemouth 5 p.c. max.	108½—109	84—86d	...
30,000		Mar. 6	8½	9½	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	132—137*	...
255,636	,,	,,	6½	7½	Do. B 5½ p.c.	129—134	110—115*	117
108,075	,,	,,	5/17/3	6/7/9	Do. C	110—115	96—101*	...
240,865	,,	,,	—	6/7/9	New Ordinary	..	..	...
832,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	105—110*	...
98,000	,,	,,	6½	7½	Epsom 5 p.c.	121—126	112—117*	...
88,426	,,	Dec. 28	3	3	3 p.c Deb. Stk.	56—60	56—61	58

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex div.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 10.

The London pitch market is unchanged, the price being about 70s. net per ton f.o.b. makers' works. Creosote is not quite so firm for the moment, probably owing to the temporary increase in freight rates to America; but already freights are becoming easier. The value to-day is about 9½d. in bulk at producers' works. There is no other change to name.

Tar Products in the Provinces.

March 10.

The market for pitch has remained steady throughout the past week; but very little fresh business is reported. No doubt the fluctuation in the value of the franc is having a disturbing influence. For solvent naphtha there is a steady inquiry, and in some quarters the price has improved.

The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 55s. Pitch, East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, 60s. to 62s. 6d.; Liverpool, 61s. to 63s. 6d.; Clyde, 62s. to 64s. 6d. Benzole 90 p.ct., North, 1s. 4½d. to 1s. 5d.; crude 65 p.ct. at 120° C., 10d. to 1s. naked at makers' works; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 11d. Toluole, naked, North, 1s. 4d. to 1s. 5d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 2½d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 8½d. to 8¾d.; salty, 8d. to 8¼d.; Scotland, 7¾d. to 8d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

TRADE NOTES.

"Columbus" Coke Separator for Inverness.

On the recommendation of Mr. A. Thomson, Gas Engineer, the Inverness Town Council have decided to proceed with the installation of a "Columbus" coke separator, at an estimated cost of £700. In a report by Mr. Thomson on the subject, he estimates that the working of the plant will result in a profit of at least £255 per annum. This will be the first of these machines to be installed in Scotland.

Tully Gas Plants.

Tully Gas Plants, Ltd., of Nos. 40 to 43, Norfolk Street, Strand, W.C., have secured an order for a duplication of the 150,000 c.ft. per day gasification plant installed at Selkirk.

Cheaper Gas at Pontefract.—The Pontefract Town Council last week reduced the price of gas, as from April 1, to 1s. 1d. per therm (4s. 10½d. per 1000 c.ft.), a reduction of 6d. per 1000 c.ft. on the present price.

Price of Gas at Wallasey.—In view of the fact that the Wallasey Corporation gas undertaking is able to contribute £15,000 for rate relief, and carry forward a surplus of £16,000, some members of the Committee considered that the consumer should benefit by a reduction of price. It was pointed out, however, that there were two reductions last year—from 3s. 3d. to 3s., and later from 3s. to 2s. 9d. per 1000 c.ft., and that next year gas and electricity would be the only two services to be called upon for rate aid. The proposal was therefore negatived, and the price of gas will for the present remain unchanged.

Burnley New Gas-Works Report.—The Burnley Gas Committee have considered a report by Mr. J. P. Leather, containing his recommendations on gas manufacturing plant to be installed in the proposed new gas-works at Old Hall, and decided that the President of the Institution of Gas Engineers should be requested to submit the names of three or four expert consulting gas engineers who, in his opinion, were competent to advise on the report. A Sub-Committee was empowered to engage one of the experts whose names were submitted; and we understand that Mr. W. Doig Gibb, O.B.E., M.Inst.C.E., has been retained.

Proposed Purchase of the Hilston Gas Company.—The Mayor (Mr. H. Toy) presided at a meeting of the Hilston Town Council, when the General Lighting Committee reported having considered an offer of the Gas Company of plant and works to the Corporation, and recommended that Mr. Hore, of Falmouth, be appointed to prepare a valuation. The Mayor said the Committee were of the opinion that the time had arrived when they should get an independent valuation. Mr. W. Hall said he doubted the wisdom of going into the matter of purchase at all. The cost of an expert would mean extra rates, and it was time to stop increasing expenditure. The Mayor said they had promised to call a meeting of ratepayers to consider the question of electric lighting, and they would have to put something definite before the townspeople. The report was adopted.

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